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VOL. XXXIV. PARTS 1 TO 6.

GENERAL INDEX.

PAGE.

P.

Q.

R.

PAGE.

S.

T.

U.

V.

W.

Y.

INDEX TO ILLUSTRATIONS

INDEX TO ILLUSTRATIONS—*continued.*

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIV. 1 JULY, 1930. PART 1.

Event and Comment.

The Current Issue.

IN this issue, Mr. Easterby continues his interesting story of the development of the Queensland sugar industry. The first instalment of a valuable paper on the Brown Cutworm is contributed by Mr. Currie; while Mr. Roberts gives some timely advice on the right way of securing information concerning parasites. Mr. White has a useful note on the Margosa Tree and its allies. The comprehensive paper on the application of science to agriculture read by Dr. Richardson, of the Waite Institute, before the recent Science Congress in Brisbane, is also presented as a welcome contribution to current thought on rural economics. Reports on the Stanthorpe fruit industry and on the work of the Banana Experiment Station, by Mr. St. John Pratt and Mr. H. Collard, respectively, are of especial interest to fruitgrowers. Mr. George Williams has a useful description of the Thin-shelled Queensland Nut. The need of better class dairy cattle is discussed by Mr. McGrath; and sheep farming and sheep licks and their uses are Mr. Hodge's subjects for this month. A note on the eradication of diseases in pigs is Mr. Rudd's contribution. The equipment and accommodation necessary for a modern piggery is described and illustrated comprehensively by Mr. Downey. A new Journal feature is introduced under the heading of "The Young Farmer," which covers matters of topical interest to calf and pig club members. The Home and Garden Section is well supplied, and other regular features make up a well-balanced and profusely illustrated number containing a wide range of very useful information and general working notes. The July Journal will be welcomed, we feel sure, by our large and ever-extending circle of readers.

The Journal.

WITH this issue we are entering on our thirty-fourth year of publication. The *Queensland Agricultural Journal* was established in 1897; the first number was published in July of that year under the direction of the late Hon. A. J. Thynne, then Secretary for Agriculture and Stock, and the editorship of the late Major A. J.

Boyd, F.R.G.S. Essentially of a utilitarian character, the Journal has been devoted mainly to the dissemination of information of practical value to the man on the land. It has been published regularly ever since, and to date it has run into sixty-three volumes, thirty-one in the old series up to 1913, and thirty-three in the new series dating from January, 1914. Every effort has been made to maintain the high standard set by its founders and first editor. The general policy of the publication is designed on positive lines in consonance with progressive agricultural thought, development, and practice, and to be of real use and value to the working farmer. There are obvious limitations to an official publication of this character, as with other authoritative technical journals. It cannot, therefore, be looked upon in the ordinary sense as a popular magazine, or a journal of light and more or less irresponsible agricultural literature. But within those limitations, it is aimed to make it a useful, interesting, and informative publication of positive opinion that will appeal to the practical farmer. As the official organ, so to speak, of the Department of Agriculture and Stock, it is recognised that accuracy and soundness are essential if it is to preserve its authoritative character as a journal of agricultural and veterinary scientific research and record, and as a vehicle for the conveyance of Departmental advice and information.

Queensland Butter and Cheese.

BEFORE distributing the prizes won at the annual exhibition of the Queensland Butter and Cheese Factory Managers and Secretaries' Association, at the Hamilton Cold Stores, on 25th June, the Minister for Agriculture and Stock, Hon. Harry F. Walker, paid a tribute to the high standard set by the dairying industry in this State. He declared that the quality of the butter sold on the local market was the best in the world. He pleaded with dairymen to continue their good work in herd improvement; it was only by that means, he said, that Australia could hold and enhance her reputation as a dairying country. "I have been in close touch with the dairying industry for twenty-five years, and have noticed a great improvement not only as to quantity but for the most part as to quality. The exhibition to-day, I am told, constitutes a record. A record is something of which we can feel proud. To-day we are in touch with one of the principal industries of the State. Only a few years ago it was ranked as fifth or sixth. To-day it is nearly second. Moreover we find that the record is approximately 2,000,000 lb. above the previous record." Nevertheless, added Mr. Walker, the production in Queensland was not what it should be. Many people would have as the excuse the financial troubles which are besetting the world. In spite of this the primary producers had gone forward right through the year. With regard to butter there had been a big improvement in quality, but they had had to compete with many objectionable features which were to be encountered in a new country. They had to go further and continue that improvement and keep on the move. These facts were supported by the Managers' Association of Queensland, one of the finest organised bodies in Queensland, composed of men to whom he "took off his hat," and who had by industry and study put the butter-making industry on a sound footing. Queensland was forging ahead more than any of the other States. There had been much talk about the quality. But he would say without fear of contradiction that the quality of Queensland butter sent away was second to none received in the Old Country from any part of the British Empire.

Prices of Dairy Produce.

CONTINUING, Mr. Walker said that butter production had certainly suffered by the smaller prices, but thanks to the Paterson scheme and co-operation throughout the Commonwealth, the position was not as bad as it could have been. The dairy farmer had received lower export prices, and that meant that he had to lower his cost of labour and cost of production. But the time would come when the position would improve. They would all have to realise that they could not abuse the privileges of life as they had been abused in the past. Many factories, as a result, had realised the necessity and seized the opportunity of increasing and improving the methods of manufacture. Science demanded that factories should be kept up to date. Many of them by their work had sown conclusively that this was the wise policy, especially when the fraction of a penny per pound involved in the sale of a slightly inferior product was considered.

Efficiency of Queensland Farmers.

MR. Walker added that the same principle applied to the farmers. Old bails, old equipment, old and obsolete methods were passing out. Farmers to-day were realising the importance of keeping their plants up to the mark and economising in labour. While they did that they were working in sympathy with the factories. This

fact was most apparent in the quality of the dairy cattle exhibited at the various shows. In his capacity as Minister for Agriculture he had obtained increasing pleasure with the improvements which had been obvious in this direction. The cattle exhibited in the Burnett district would compare with any in the Old Country. He said that advisedly, realising what a big statement he was making. If they followed these lines they would obtain that great goal—a decrease in the cost of production. That decrease in the cost of production was the keynote of Australia's success. It was of no use talking about lowering wages until that was brought about. They had to economise.

From the farmer's point of view, economy was not the using of a poor cow when a good cow should be obtained. It cost almost as much to feed a poor cow as it did to feed a good one, and often a poor cow involved more labour because it was often harder to milk. All these were factors working towards this necessary economy, and the dairymen of Queensland had been imbued with the one object—to reduce cost—and they had done more towards that end than any other body of men he knew. Again, Mr. Walker emphasised the excellent quality of the cattle at country shows as an example.

Yet there was still a great deal to be done in order to keep pace with other States. He was big enough to acknowledge the good work done by the former Government in regard to the legislation on herd improvement. It was because certain men who had a monopoly of high-class stock had abused their privileges that the Government had been forced to reduce the subsidy on well-bred bulls from £50 to £25. If only one or two of the bull-breeders, who had this monopoly, had played the game fairly this reduction would never have taken place.

"I want you to instruct the dairymen in each of your districts to try to improve their herds," said Mr. Walker. "One thing they can all do—eliminate the wasters from the herds. But don't hold a compulsory sale and sell them all to your neighbour. Sell them to the butcher for beef."

In conclusion, Mr. Walker said that if any of those engaged in the industry had any practical or commonsense suggestions by which it could be improved, it would be their own fault if they were not brought forward and tried out. His department would be always willing to assist.

Visit of New Zealand Farmers.

ONE big event of the month, from a rural point of view, was the visit of a large party of New Zealand farmers who came to see for themselves how primary industries are developing in this State. They were also eager to exchange ideas on farming and stock-raising practice. While readily giving useful information on New Zealand conditions and methods, they, as shrewd observers, were out to acquire knowledge of our conditions of settlement and development. Their impressions of Queensland were freely voiced and were, in the main, most favourable. These will be reviewed in the August Journal.

The visitors came chiefly from the famous Canterbury Province in the South Island of the Dominion, while North Island was also strongly represented. The organisation of the tour was the last word in efficiency, and for this the Queensland Railway Department, in association with the Department of Agriculture and Stock, earned high praise from the Dominion visitors. Farmers and citizens of the districts through which they passed also assisted with typical Queensland hospitality.

The value of inter-dominion visits such as this is so obvious that it is scarcely necessary to unduly emphasise the fact. Apart altogether from the advantages on the technical side, there is the importance of our getting to know one another better, of our appreciation to each others' viewpoint, and of our understanding each others' ideas of the need of the closer association of the people of both the Commonwealth and the Dominion. After all, our destiny is identical, our difficulties are common, our national and imperial aspirations and problems are the same. The future of each country must be, from the geographical viewpoint alone, inseparable. But above that, there are our common ties of kinship. They with us possess all our cherished traditions as people of the one race, people endowed with the composite character of all the British peoples and their common genius for government and enterprise. Then there is the name we commonly share: the name coined in the Great War, when the blood of men of the Homeland and all the Overseas Dominions flowed in a common stream; the name that has become immortal; the name that is untarnishable; the name that stands for all that is great and noble in the history of our race—the imperishable name of Anzac.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VII.

(b) Review of the Industry Since Federation (*continued*).

HAVING traced to some extent the history of those mills established under "*The Sugar Works Guarantee Act of* 1893," and the taking over of certain of them by the Government in 1904, a return may be made at this juncture to the earlier years of the present century. The next noteworthy landmark in the history of the industry took place in 1906, when a Royal Commission was appointed by the Queensland Government to inquire into and report upon—

(1) The number of Pacific Islanders to be deported in Queensland at the end of 1906, their present residence, localities to which they have to be deported, and the most efficient manner of repatriating them with the probable cost thereof;

(2) Whether there be in the State of Queensland any Pacific Islanders whose compulsory deportation would be inconsistent with humanity or with good faith;

(3) Whether sufficient labour for carrying on the Queensland sugar industry is likely to be available when Pacific Islanders can no longer be lawfully employed, and, if sufficient labour for such purpose is not likely to be locally obtainable the best means of supplying the deficiency.

This Commission consisted of Messrs. R. A. Ranking, Police Magistrate, W. T. Paget, M.L.A., and C. F. Nielsen, M.L.A. The inquiry lasted from April to June, 1906, and a great deal of evidence was taken from millers, canegrowers, labourers, clergymen, police officials, missionaries, labour agents, tradesmen, Pacific Island inspectors, owners of recruiting vessels, Government agents, and the kanakas or Pacific Islanders themselves.

The evidence given before this Commission was of an interesting nature. The inquiry was held practically in the middle of the transition period from black to white labour and just before the increase in bounty paid for white-grown cane had got to work. One or two of the old type of millowner was still operating at that time who had no faith whatever in white labour. One at Mackay, who passed away two or three years after, was asked if he still had faith in the sugar industry and replied, "I have no faith in the sugar industry under the conditions we are supposed to submit to now. I have no faith in white labour. . . . I do not intend to try what I consider an impossibility. . . . Stimulated by the bonus and whilst good seasons last a false confidence in the future will be created, which, on the withdrawal of the bonus and recurrence of indifferent seasons, to which we are so liable, will create disaster. The withdrawal of the kanaka will gradually force the industry into Southern latitudes less congenial to the cane, but more

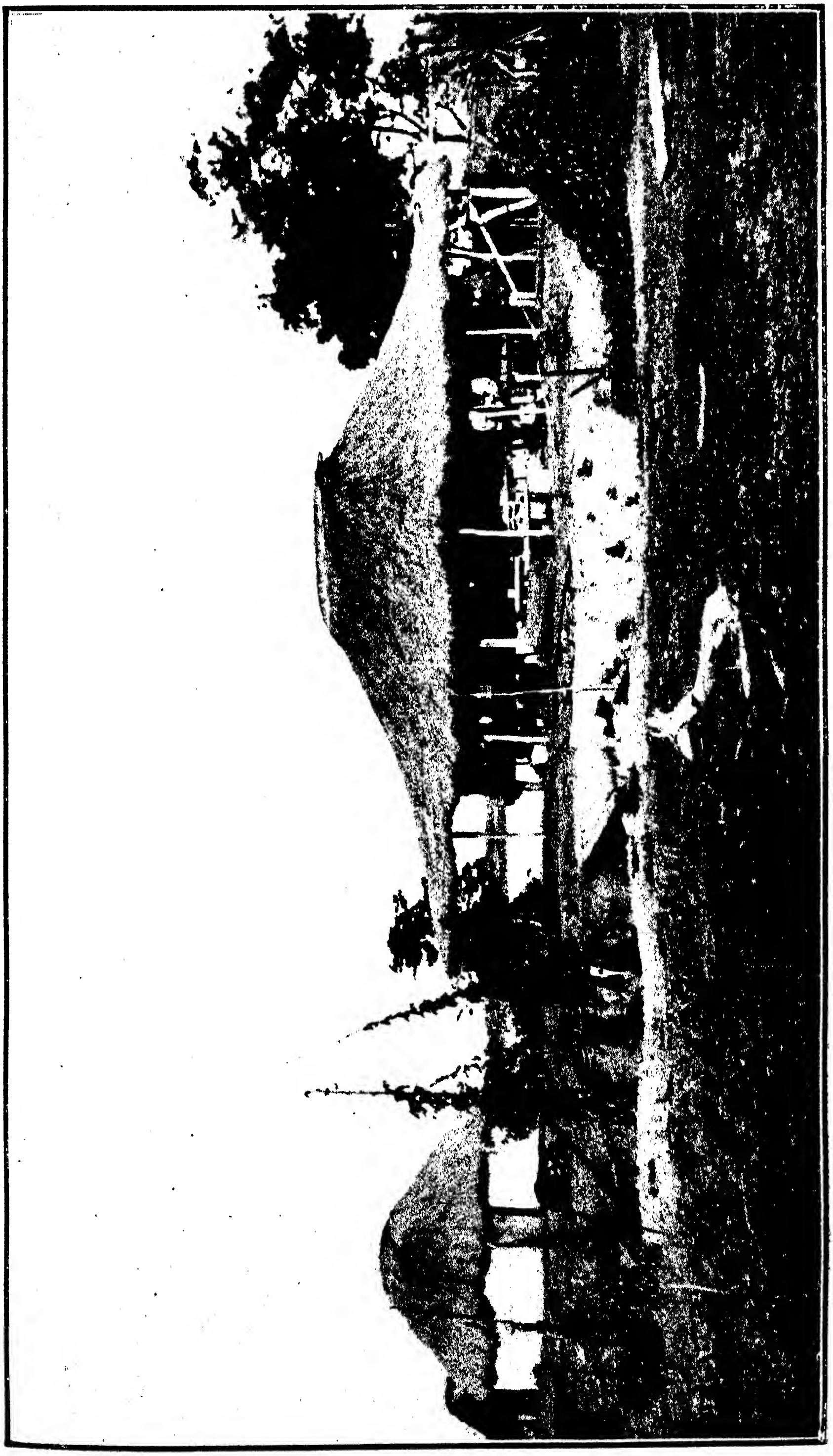


PLATE 1.—KANAKA HUMPY AT MACKAY.

favourable for white labour." Other millowners and farmers reported favourably of their experience of white labour, and with the increase of the bounty intended to augment their white-grown areas.

Quite a number of Pacific Islanders gave evidence. Some of them had primitive ideas about marriage. One "boy" named Keeseree, native of Malayta Island, when asked if he had married an island woman, said he had married an aboriginal, but not in church—"No, I go along Inspector Durham and tell him I going to keep this woman and I keep her; I got one boy fifteen months old, no other pickaninny come up." He did not want to go back to the islands—"wanted to stop along Queensland." "I sorry for the woman, I no want to leave her here, but I frightened to take her home; I frightened man Malayta kill her."

Many of them did not want to leave for the islands. Their grievance mainly, at that time, was that they could not get work. Others said, "Suppose me get passage money and 'box' and 'everything,' me go home. Want tobacco, knives, axe, matches, and little fellow saucepan. Must have 'box'; my countrymen make a row alonga me if me have no box." Another had a letter written for him to the Commission, in which he said, "Many of us have been in this country for twenty to thirty years, and feel happy and content if we could get work, but we find the farmers refuse to engage us under the usual agreement, informing us that if they did so they would be made liable to pay our passage home, besides our wages after the latter end of this year."

The "box" referred to above contained the portable and personal property of the Pacific Islander and usually played a large part in his mental outlook.

The Commission's recommendations concerning the Pacific Islanders were that the following should be exempted from deportation at the end of 1906:—

(*a*) Those Pacific Islanders introduced into Australia prior to 1879.

(*b*) Those of extreme age or suffering bodily infirmity and unable to earn a livelihood if returned.

(*c*) Those being married to, or living as man and wife with, a native of some other island than his own, so that he could not be deported without risk to the life of himself or his family.

(*d*) Those married or living as man and wife with a female not a native of the Pacific Islands.

(*e*) Those having offspring educated in the State schools.

(*f*) Those who on 1st July, 1906, and still were, registered as the beneficial owner of a freehold in Queensland.

(*g*) Those who were holders of an unexpired leasehold, compensation for the relinquishment of which had not been paid him as provided either by the provisions of the lease or by law; or

(*h*) Those continuously resident in Australia for a period of not less than twenty years prior to 31st December, 1906.

The above recommendations with the exception of (*e*) and (*g*) were given effect to in the Commonwealth Pacific Islanders Act of 1906, but a certificate of such exemption could only be issued when a Pacific Islander had proved to the satisfaction of the Minister that he was so entitled.

With respect to the supply of white labour after the withdrawal of the Pacific Islanders, a number of recommendations were made for the establishment of Labour Intelligence Bureaus, where reliable information could be obtained regarding supply and demand, and that where Crown lands suitable for closer settlement existed within or adjacent to sugar districts same should be made available in relatively small holdings for occupation by workers of limited means; that efforts be made to ascertain the probable number of unemployed within the State and in the States of New South Wales and Victoria, and to bring under the notice of such workers the nature of the employment offering, and if necessary to disseminate such information in the United Kingdom and Continent of Europe. From this it will be seen that a fear existed once the kanaka was deported that there would not be sufficient white labour to take his place, but eventually it was realised that this fear was groundless and to-day there is far more labour offering than the industry can absorb.

The number of Pacific Islanders liable to be deported at the end of 1906 was estimated at 4,500, and many people will no doubt recollect the deportation of these Islanders. They could be seen making their way to the wharves carrying all sorts of junk, old iron, hurricane lanterns, violent-coloured petticoats, &c., and in some cases trying to smuggle firearms aboard—strapped to the women's legs under their petticoats. Eventually all that were to be deported were got away and little or nothing is now heard of the old blackbirding days.

The conditions surrounding white labour at most of the mills in the early part of the century were none too brilliant, nor of a nature to induce white men to remain permanently in the service of the mills, nor were they calculated to promote the interests of the mills themselves. The men were lodged in barracks which were constructed to accommodate from twenty-four to fifty or more men. The buildings were in some cases partitioned into rooms to hold from eight to twelve or more men in a room. In others there was no such division, and as many as fifty men could be found living indiscriminately in the same building.

As usual the majority of these men were of good habits, while the minority included men of different traits. This meant that the reliable and steady workmen had no chance or guarantee of quiet or rest either day or night. The Government at once took steps as far as the Central Mills were concerned to greatly improve the conditions by increasing the buildings for the housing of the men, partitioning same off into small rooms, so that not more than two men would occupy

one room and two men known to each other could live unmolested in privacy and quiet. Verandas were built to protect the rooms from heat and enable men to sit outside, and when nights were hot to sleep outside.

In the old days the bunks or sleeping provision for workmen were of the crudest character; the bunks were fixtures, the bedding used was dry grass, cane tops or even bagasse from the mills, and in no cases were mattresses provided. All these were swept away and rooms were cleaned and fumigated, and mattresses and pillows provided, while men were provided to dust out and clean the rooms; bathrooms and showers were installed as well as reading-rooms with ample table and seating accommodation. Provisions were also made for the insurance of the men. This resulted in great satisfaction to the white labour then employed at the Government Central Mills.

Shortly after these alterations had been made an Act known as "*The Shearers and Sugar Workers' Accommodation Acts*, 1905-1906" was passed, which provided for suitable accommodation for workers, ventilation, &c. Provision for 360 cubic feet per man was to be made in respect to sleeping accommodation, proper cooking and cleansing materials were to be supplied, and receptacles provided for rubbish, &c. This Act remained in force until superseded by "*The Workers' Accommodation Acts*, 1915 *to* 1921," which repealed the former Act. Better provisions were made in this new Act for the general comfort of workers, and 480 cubic feet of air space was to be allowed for each man in sleeping-rooms. Baths and an adequate supply of water were to be furnished wherever possible. Verandas were also to be provided. It will be noticed that most of these improvements had already been put into operation at those Central Mills under Government control prior to the passing of the above Acts.

In 1907 the Australian Sugar Producers' Association was formed in Townsville, as the result of a conference in that city organised by the Chamber of Commerce. This association has played a large part in the development and protection of the sugar industry since that date.

In 1909 the first Director of Sugar Experiment Stations, Dr. W. Maxwell, retired on the expiration of his agreement with the State Government. From 1905 to 1909, Dr. Maxwell was also Comptroller of Central Sugar Mills under Government control.

The year 1910 saw the record production of sugar to that date—viz., 210,756 tons of raw sugar—the previous highest yield being in 1907 when the production totalled 188,307 tons. The rainfall in 1910 was particularly heavy. The tonnage of cane per acre in that year was exceptionally good, the average for the whole State being 19·45 with 2·23 tons of sugar per acre.

In the following year, 1911, the great strike of sugar workers took place for higher wages and better conditions mainly for mill workers, but supported by the field labour and afterwards by the waterside workers. The first mutterings of the storm were heard at the beginning of the year, and in February a demand was made on the Australian

Sugar Producers' Association in respect of the wages and conditions in the industry. Bundaberg workers asked for 30s. a week and found, and the abolition of the contract system of cutting cane was also pressed for. As time went on the fight grew very bitter. There was a Commonwealth Labour Government in office at the time and members thereof took a more active part in the quarrel than they would think of doing nowadays. The Acting Prime Minister, Mr. W. M. Hughes, who was also president of the Waterside Workers' Association, is reported to have said he would repeal the duty on sugar as a means of cutting the Gordian knot. Mr. Tudor, Minister of Trade and Customs, visited the Bundaberg district and made many strong remarks. Mr. Bamford, the Federal Labour member for the Herbert, said at Mackay that he did not think the duty would be repealed, but he warned farmers to settle the strike, and implied that if it were not settled a proposal would be introduced and probably passed by the Federal Government to build a refinery in New Guinea. A Society of Free Workers was formed in Victoria and many men from that State and Tasmania found their way to Queensland and commenced work under protection. Riots took place at Childers, and seventeen men were arrested. A tram carrying free workers was attacked by strikers at Huxley; disorderly scenes were enacted at Bundaberg and other places, and a large number of the mills were manned by the farmers. Firearms were flourished and a good deal of hot feeling was engendered on both sides. The watersiders at Cairns and Sydney, and also at other ports, took a hand and refused to handle sugar. In August a conference was proposed which resulted in certain terms being accepted, and the calling off of the strike. The terms were as under:—

(1) Wages to be at the rate of 30s. a week and keep as a minimum for adult labour at the mills. Overtime to be at the rate of time and a-quarter.

(2) Ordinary week's work to be at above rates and limited to forty-eight hours per week.

(3) Time worked at ordinary rates not to exceed nine hours on any one day.

(4) Employers and employees to meet and endeavour to arrange mutually satisfactory agreements for the following season.

(5) No vindictive spirit to be shown to the men.

(6) Strike to be called off forthwith.

There is no doubt that the men were paid on too low a scale at the time of the strike and that the accommodation was not as good as it ought to have been. The regulations under the Bounty Act in 1912 fixed the minimum rates of pay for adults at 48s. per week, without keep, and the hours of labour forty-eight per week, as has been previously mentioned, but these rates have long since been passed in the successive increases that have been made since that date by Awards of Industrial and Arbitration Courts.

[TO BE CONTINUED.]

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART I.

Introduction.

THE brown cutworm is the larva of a noctuid moth, *Euxoa radians* Guen. In Queensland it is distributed over all the coastal agricultural areas and extends westwards over the coastal range into the closely settled districts of the Burnett, Callide, and Dawson Rivers. It has been recorded as far west as the Great Dividing Range in the Central district, and Mungallala in the Southern district of Queensland. It is common in New South Wales and West Australia and is recorded from Victoria, South Australia, and Tasmania. In Hampson's "Catalogue of the Noctuidæ," the records outside Australia are from New Zealand, Norfolk Island, and Friendly Islands.

In the caterpillar stage it is destructive to many crops of field and orchard, the most common form of damage being the severing of the stems of seedlings and the eating of the leaves.* (Plate I., figs. 5 and 6.)

Cutworm attacks on vegetable crops on light soils are of yearly occurrence in Queensland, always more or less severe in different localities, but the widespread and devastating attacks on cotton seedlings occur only sporadically, a break of a variable number of seasons usually occurring between attacks. This is true also for widespread attacks on maize seedlings and other field crops.

The pest is, then, of seasonal and sporadic appearance, the destruction it causes being most common in the spring months in Queensland, although in summer and autumn attacks may occur if conditions favour the species.

Among economic crops attacked in the seedling stage may be enumerated beans, beetroot, cabbages, carrots, cotton, maize, peas, tomatoes, and wheat.

In the investigation, the results of which are set forth in this paper, the chief crop studied was cotton, but attacks on many crops of field and garden were examined with a view to gaining all possible evidence.

In working out the general œcology of the cutworm a special study has been made of its rate of development in relation to temperature. It is hoped that the results of this study will aid in predicting outbreaks and so in controlling them.

LIFE HISTORY.

In tracing the life history of the species, a beginning will be made at the point where the adult moth emerges from the winter pupation, and thence each successive stage will be followed.

Adult.

After breaking through the pupal coverings and the earthen containing cells, the moths push their way to the surface of the ground and hang from the under surface of leaves or pieces of débris till the wings are stretched and have hardened. They then fly off to feed on nectar from the spring flowers in the evenings and at night.

Pairing takes place at night; the moths lying quiescent during the day, well hidden under débris. When disturbed they dart along near the ground in short flights reminiscent of the flight of a plump quail,

* Certain of the references made in this article refer to plates, graphs, &c., which will appear in subsequent parts.

then pitch suddenly out of sight under cover. Their colour harmonises well with their natural surroundings and they do not stir unless very closely approached.

Oviposition.

After pairing the females are ready for oviposition, the time elapsing between emergence and pairing, and between pairing and oviposition varying with the state of the weather and presence of suitable laying conditions. Warm weather will decrease and cold weather increase these periods. Table VI. shows the time elapsing between emergence and oviposition.

Eggs are laid under suitable host plants in loose soil when conditions are favourable. Ballard[1] found that a slightly moist soil under low growing weeds was a favourite position. It has now been found that when moths are ready to lay and host plants are present, they will also oviposit in fairly dry soil, and that a very wet soil is repugnant to them. When the soil is wet they tend to scatter the eggs over the host plant itself, contrary to their normal habit of laying a batch of eggs all together just under the loose surface of the soil.

The position chosen by the female for oviposition is important, as it has a bearing on control methods. In 1926, during the October and November attack, no eggs were found under cotton seedlings but all were found under low-growing shady host plants, particularly Bullhead (*Tribulis terrestris*). In 1924, however, eggs of *Euxoa radians* were found under cotton seedlings near Rockhampton, but it was not stated whether there were weeds associated with the eggs or not. The importance of the point is that if eggs are laid under the seedlings, such forms of control as barrier furrows round the fields are useless.

It would appear that where bushy plants of bullhead are available and the soil under them loose, the moths prefer them to anything else for oviposition. If the season is too early for such bushes to have developed, and if seedlings of cotton are available in loose soil, it is probable that the moths flying in from the headlands, or from surrounding vegetation where they shelter during the day, would lay under the seedlings in the first rows they happen to cross. More evidence is necessary on this point before it can be definitely determined.

In the laboratory eggs were almost invariably laid at night, but on one occasion oviposition was actually witnessed about 9 a.m. A female at her last lay and nearly exhausted was observed under the pigweed (placed there for cover) in the act of laying. She squatted on the loose soil surface and pushed the tip of her abdomen backwards and downwards into the loose soil. A slight convulsive movement of the abdomen marked the passage of an egg to the ovipositor. The tip of the ovipositor was then pushed downwards till it touched the false bottom of the container over which the loose soil had been scattered. The egg was placed against this false bottom and adhered to it by some cementing fluid. The wings were half extended and quivered gently all the while, scales being shed on the surface of the ground. After each egg was laid the body was moved slightly forward or sideways so that the eggs touched, but overlapped very little.

Eggs are laid in batches, generally one batch each night until the death of the female. The dead body of the female was frequently found in the field, lying over her last batch of eggs.

Table I. gives the numbers of eggs laid by some of the females reared in the laboratory.

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

TABLE I.

Euroa radians GUEN., NUMBER OF EGGS LAID BY FEMALES REARED IN LABORATORY.

Average Temperature, 22·7° C.		Average Temperature, 22·7° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 26° C.		Average Temperature, 26·7° C.	
Moth Adult, 6th December, 1927.		Moth Adult, 10th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 28th December, 1927.		Moth Adult, 30th January, 1928.		Moth Adult, 11th February, 1928.	
Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.
1927. 15th Dec. ..	23	1927. 17th Dec...	250	1927. 31st Dec. ..	63	1927. 31st Dec. ..	105	1928. 4th Jan...	61	1928. 3rd Feb...	569	1928. 14th Feb...	161
16th Dec. ..	24	18th Dec...	135	1928. 1st Jan. ..	224	1928. 1st Jan. ..	153	5th Jan...	123	..	..	15th Feb...	184
20th Dec. ..	137	19th Dec...	38	2nd Jan...	72	2nd Jan...	288	6th Jan...	139	..	..	..	..
21st Dec. ..	66	..	..	3rd Jan...	180	3rd Jan...	65	7th Jan...	218	..	..	..	..
..	..	..	..	4th Jan...	7	..	..	8th Jan...	147	..	..	..	..
..	..	..	..	..	..	..	..	9th Jan...	65	..	..	..	..
Totals ..	250	..	423	..	546	..	611	..	753	..	569	..	345

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

Length of Adult Life.

As can be seen from Table I., the length of time between emergence of the adult female and oviposition varies with the temperature. The length of life of the adults varies in a similar way.

In the laboratory the length of life of males varied from about six days at an average temperature of 26 deg. C. to about twelve days at an average temperature of 22·5 deg. C.

The females were more variable, and their length of life varied from five to seventeen days, having an average of eleven days for forty individuals. It would appear that in the field females could live for a longer period if they were unable to oviposit owing to unfavourable conditions. They died immediately after their last lay, however.

Some females in the laboratory were found to lay abnormally large eggs which were invariably infertile. Others were swollen with eggs but failed to oviposit. Dissection showed that these females contained collapsed and unchitinised spermathecæ in strong contrast to the dark-coloured, firm, and highly chitinised spermathecæ of females laying normal fertile eggs.

Egg.

Laid under cover, the eggs are protected to a considerable extent from dessication, too great heat, and natural enemies. Exposure to direct sunlight will kill the eggs and an average shade temperature of 37 deg. C. is fatal to them in time. They hatch in from three days upwards. (Graph II. (D).)

In all batches of eggs experimented with it was observed that either the percentage fertility was complete (100 per cent.) or that the whole batch was infertile. In the field no infertile eggs have been seen.

Larval Instars.

When ready to emerge the tiny larvæ use their strong mandibles to break down a portion of the egg shell large enough to allow egress. They eat this portion of the shell but have not been seen to eat any more of it.

Hatching takes place at any hour, and the emerging larvæ are very active, moving with a looping gait like geometrid larvæ. In keeping with this habit the anterior two pairs of abdominal legs, or "larvapods," are reduced in size.

Very little, if indeed any, silk spinning is done in this instar. When disturbed on a food plant the small larvæ drop straight to the ground without putting out a silken thread, and then lie curled up amongst the débris. The reduced state of the spinneret, as shown in Plate VII., fig. 3, is in keeping with the absence of extensive silk spinning.

The larvæ are extremely active for some time after hatching, moving rapidly, and usually not feeding for some little time. They are positively phototropic and negatively geotropic, moving outwards and upwards from their place of origin. After their first burst of feverish activity they settle down on a convenient host plant to feed, but the effect of their first set of tropisms is to aid in their dispersal from the point of origin, although many individuals may remain on the plant under which they have been hatched.

For the duration of this first urge, food plants may be passed without any display of interest, but when the first urge is satisfied, feeding is

immediately resorted to. Owing to the relatively large size of the hollow setæ of this instar, and the light weight of the body, the wind can easily catch up the larvæ and aid in their dispersal.

During the first instar, and growing progressively less throughout the later instars, is a tendency for the larvæ to congregate together on a leaf when feeding; small groups being found with their bodies touching along their length. Tender succulent food only can be eaten by the small larvæ, and in the case of cotton, the cotyledons form their first food.

When breeding caterpillars in the laboratory it was found necessary to cover the tops of the breeding jars with fine cloth when hatching of eggs was in progress, as the larvæ on emerging, immediately made for the top of the jar. After about two days this cover could be dispensed with as the larvæ normally did not again attempt to climb out of the jar, hiding during the day in the soil provided for them, or under cover of some débris on the bottom, and feeding during the night. For the rest of their larval lives, except in cases of disease or parasitism, the larvæ are positively geotropic and negatively heliotropic.

When feeding on cotton cotyledons the young larvæ feed on the underside, eating through to the upper epidermis, which, however, they often leave intact. The upper epidermis then sinks into the hollow space underneath, giving the characteristic pitted appearance of the work of young larvæ.

The second and subsequent instars up to the sixth, feed by night and hide by day in the soil, burying themselves deeper as they increase in size, and the bigger ones following the true "cutworm" habit of cutting through the stems of seedlings and pulling the leaves down to the ground for consumption. The younger stages usually leave the soil and climb on to the host plant to feed while the elder ones cut down the leaves and pull them into the soil, thus enjoying, even while eating, the protection which the soil affords.

At each moult there is a pre-moult cessation of feeding and period of rest, followed by the moult. The newly moulted larva has always a very light colour for some hours after moulting, but later becomes darker.

In all there are six instars, the duration of each according to temperature, being shown in Graphs II. and III.

The final instar larva grows to a greater size under cool than under hot conditions, and the moths from the larger larvæ have a larger egg capacity than from the smaller. The consequences of this will be considered in the general œcological discussion.

As the larvæ increase in size their capacity for food increases rapidly, so that the ravages of the pest soon become evident. On hatching the larva weighs only about ·002 grams and when full grown about 1·4 grams, an increase of 700 times, which argues a rapidly increasing power for destruction.

When the larva becomes full grown, it cuts its way into the ground, the depth varying with the hardness of the soil. In loose soil it goes to a depth of 3 inches and in hard soil from ½ to 1 inch. An earthen cell is built and the larva enters a resting pre-pupal stage.

No silken cocoon is spun, although it appears probable that some cementing material is used in building the walls of the earthen cell.

This cell has waterproof properties and a cohesive strength, due to the cementing material.

During the pre-pupal stasis the larva shrinks and slowly assumes the tapering shape of the pupa. The gut is cleared of faeces and there is a concentration of the protoplasm by the passing off of moisture.

The following tables show the daily loss in weight of full-fed larvæ during this stage:—

TABLE II.

DAILY LOSS IN WEIGHT OF FULL FED LARVÆ OF *Euroa radians* DURING PRE-PUPAL STASIS.

Series 1.

Date.	Weight in Grams.		
	Number 1.	Number 2.	Number 3.
1928.			
29th January	1·4	1·3	1·5
30th January	·85	·8	1·2
31st January	·67	·645	·74
1st February	·505	·55	·63
2nd February (pupated) ..	·39	·41	·52
3rd February	·39	·41	·46
4th February	·39	·41	·46
21st February	·39	·41	·46
	Emerged as adult moths, 21st February, 1928.		

Series 2.

Weight of five full-fed caterpillars = 6·2 grams = 1·24 grams per caterpillar.

Weight of five caterpillars shrunken at pupation = 2·125 grams = ·425 grams per caterpillar.

Loss in weight, Series 1 = 70 per cent.

Loss in weight, Series 2 = 66 per cent.

Average loss in weight = 68 per cent.

Pupa.

When the pupa is fully formed under the old larval skin, there is a splitting of the latter along the dorsum of the thorax and the humped up thorax of the pupa protrudes. A rhythmic movement of the pupa then slips the exuvium caudad, and in this process the cremaster comes into play. At each upward movement of the tip of the abdomen, the hooks of the cremaster engage in the loose exuvium. The tip of the abdomen is then swung backwards and downwards, the hooked cremaster pulling the exuvium with it. The hooks then disengage, the tip of the abdomen is again raised for another pull, and so the exuvium is gradually brought clear of the pupa.

The pupal skin is a pale amber colour immediately after moulting, but darkens to a rich brown after a few hours. As pupal development proceeds the colour steadily darkens and when near completion the dark markings of the wings are discernible through the pupal skin, as also are the legs and haustellum. When development is complete the adult

moth emerges from the cocoon and pupal cell and flies off to recommence the cycle.

The times of development for each stage are fully dealt with in another part of this paper.

Seasonal Life History.

The individual life history having been dealt with, the seasonal life history can now be traced. The spring brood originating from the over-wintering parents has been most destructive in the cotton areas, about October. In November and early December there is sometimes a recrudescence of damage from the second brood of the season, but the mid-summer brood is seldom very destructive unless conditions are particularly favourable to the species.

On the coastal areas damage may occur all the year round, even in winter, but west of the coastal range where severe frosts are experienced, damage does not occur in the winter months. Moths have been captured during each month of the year on the coast, and in favourable areas inland breeding is continuous, although a dragging out of the life history in the cold season takes place.

Broods are continuous throughout the year, except that in the winter months only the pupæ in the ground survive in areas of severe frosts, as not only are the larvæ which may be present checked in development, but their food plants are killed off. It so happens that no feeding stage can persist in a severe winter, but the pupæ in the ground survive. The pupal instar is lengthened, but there appears to be no periodicity about it, only the direct effect of continuous reaction to temperature. This lengthening of the pupal instar allows it to be carried over until rising temperatures and spring showers bring out both itself as adult moth, and host plants to support its offspring.

The length of life of *Euxoa radians* from the hatching of an egg to the time when the caterpillar has become an adult female moth, mated, and laid eggs, is shown below:—

At 20 deg. C.	about 106 days
At 25 deg. C.	about 65 days
At 30 deg. C.	about 52 days

The proportion of males to females is about even. In one group, emerging from the pupal stage November and December, thirty-nine were males and thirty-seven females.

[TO BE CONTINUED.]

INQUIRIES CONCERNING PARASITES.

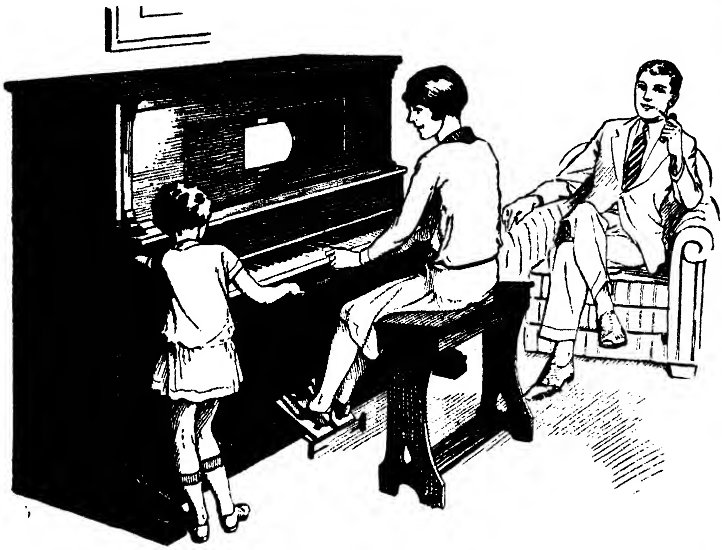
DIRECTIONS TO STOCKOWNERS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in spirits or formalin. A 10 per cent. solution of formalin is preferred. This may be prepared by adding three volumes of water to one volume of commercial formalin. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.



(c) Care should be taken in packing the container for postage. The postal regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(d) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the nature of the country on which the animal had been accustomed to feed; (4) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (5) whether the parasite was lying free, attached, or in nodular form; and (6) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(a) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(b) Fleas, mites, and lice are best forwarded in spirits.

(c) Ticks are preferred alive, though if necessary they may be sent in spirits or formalin. Partly engorged and unengorged specimens are preferred. The males are required and these are usually to be found wandering about in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good steady and patient pull will also yield good results.

(d) In all cases the host, locality, type of country, and part of animal infested should be noted.

THE MARGOSA TREE AND ITS ALLIES.

By C. T. WHITE, Government Botanist.

Considerable attention has been directed recently to the possible use of the oil from the seed of the Margosa tree as a general insecticide and germicide, particularly in relation to the blowfly pest in Australia, so a few notes on it may not be without interest.

Azadirachta indica is a native of Ceylon and India. In the former country it seems to be universally known by its Portuguese name of "Margosa," and the oil from the seed is held by the natives in great repute as an external application for sores, rheumatism, &c. It is a tall tree allied to our White Cedar, and in India and other parts of Asia is widely planted as a shade and ornamental tree. It is not found wild in Australia, and I do not know that it is to be seen growing in any Australian gardens, though it would seem strange if it has not been introduced. It is possible it is growing in some places and has been passed by as an ordinary White Cedar.

The tree is sometimes known as *Melia Azadirachta*, but most botanists now keep the genus Azadirachta as distinct from Melia, though the distinctions are but slight. As at present understood the genus consists of but two species, *Azadirachta indica* of India and Ceylon and *A. integrifolia* of the Philippine Islands.

Melia azedarach, of which our White Cedar has been considered by some botanists to be merely a variety as now understood, is considered to be confined to Northern India, Persia, and China. It is commonly known as the Indian or Persian Lilac or Bead tree.

Melia dubia is the name now generally accepted for the White Cedar of the rain-forests (jungles, brushes, or scrubs) of coastal Queensland and Northern New South Wales. In addition to Australia, however, it has a wide distribution through tropical Africa, tropical Asia including Southern China, Formosa, and the Philippines through the Malay Archipelago and New Guinea to Australia.

The tree is sometimes known as *Melia composita*, but the specific name *dubia* has nearly forty years priority. As mentioned above the Australian tree has been considered a variety of *Melia azedarach* and named *Melia azedarach* var. *australasica*, though it would seem preferable to keep it as above outlined. The seed is not known to contain any oil, but the matter is one worthy of investigation.

APPLICATION OF SCIENCE TO AGRICULTURE.

By PROFESSOR A. E. V. RICHARDSON, M.A., D.Sc., Director, Waite Agricultural Research Institute.

In an address delivered to the Australian and New Zealand Association for the Advancement of Science, Brisbane, 2nd June, 1930.

The meeting of the Australian and New Zealand Association for the Advancement of Science in the Capital City of a State with such vast agricultural and pastoral resources as Queensland formed an appropriate occasion for discussing the importance of the primary industries to national welfare, and the desirability of developing these industries to the utmost extent attainable.

The discussion of this question is appropriate because the agricultural community is being urged on all sides to increase the production of exportable commodities in order to alleviate the financial difficulties which are temporarily confronting the Commonwealth.

In this paper Dr. Richardson demonstrates the relationship of scientific research to the development of agricultural practice, and how further development in these industries depends upon the application of scientific knowledge.

IMPORTANCE OF AGRICULTURE.

THE agricultural and pastoral industries provide the food supply of the nation, the raw materials of the manufacturing industries, and are the pillars on which the prosperity of the Commonwealth rests. The total value of production from all sources in Australia, according to the 1927 Year Book, was £430,000,000 sterling, of which the primary industries, excluding mining, contributed £262,000,000, or roughly 60 per cent.

But, quite apart from its material importance, the agricultural industry has a special significance to national life. Agriculture is one of the great permanent industries. As Sir Robert Grieg states, "Coal seams come to an end, and the discovery of new sources of energy changes the value of coal. Advances in physical science may, by creating new industries, destroy old ones. Gold, silver, copper, and lead mines have a relatively limited life in the history of the nation, and every ton of ore raised leaves the mine so much the poorer. But agricultural wealth, the capacity to produce every year the food and clothing without which life ends, always has been and always will be the foundation of national and world wealth."

Moreover, the conditions of country life are peculiar in their contribution to health, their stimulus to personal initiative, and their fostering influence on that spirit of individualism on which rest free institutions and democratic government. Rural populations exert an important influence in the mental outlook and physical vigour of the race.

Furthermore, the business of farming, dealing as it does at every step with the subtlest laws of nature, is capable of indefinite improvement as soon as and as rapidly as the findings of science are applied to its affairs.

Agriculture has been referred to as the oldest of the arts, and the most recent of the sciences. In the older countries of the world agriculture has been an art based upon experience and handed down from father to son by tradition. Even to-day a considerable part of what the farmer needs is practical experience, but the other part—the scientific side of his business—is becoming more and more important. If we are to keep pace with the progress of agriculture in other countries, agricultural science must subtend an ever widening angle to agricultural practice.

Finally, agriculture is an enormously productive industry, and money expended on its development by research and education gives a liberal return on the investment. Every day in the year the aggregate production of new wealth from the soil in Australia exceeds £500,000 sterling, or nearly £200,000,000 sterling per annum. If, through the promulgation of better methods of feeding and breeding dairy stock, the production of butter fat could be increased by the small amount of 10 lb. per cow, it would mean an increase in annual production of approximately £2,000,000 sterling. Each bushel of wheat added to the wheat yield of Australia results in a permanent

addition of £3,000,000 to the national income. Every pound of wool that can be added per sheep by improved nutrition or elimination of pests, would add at least £5,000,000 per annum to the national income. Every insect and fungus pest we learn to control adds enormous wealth to the Commonwealth.

It is because of the recognition of the unique importance of agriculture to the national welfare that other countries, notably the United States of America, Canada, and South Africa, and more recently Britain, have established and maintained at national expense institutions for fostering research and development in agriculture.

If the development of agriculture were merely the concern of the farmers, they might be left to provide it for themselves. But in the final analysis, the development of agriculture is of national importance, and public funds are therefore freely appropriated by these countries for its orderly development.

The public support of scientific research in agriculture on all these grounds should, therefore, be accorded freely with understanding and with patience. This is the era of the application of science to industry, and its triumphs have been witnessed in our time in the remarkable development of transport, aviation, wireless, engineering. The era of the application of science to agriculture is fast approaching, and when it comes the returns will be vastly in excess of the money invested in it.

SCIENCE AND PROGRESS.

Before considering the possible results of the application of science to agriculture, let us consider brifly the bearing of science on human progress and industrial development.

> "The progress of civilisation very largely depends on the development of science and its application to all phases of life—to the everyday problems of education, health, transport, housing, land settlement, and agriculture. If substantial progress is to be made in these fields it can only be along a road of which the foundations have been laid by scientific thought and research."—H.R.H. the Prince of Wales, B.A.A.S., 1926.

"Real progress," said Sir William Ramsay, "consists in learning how better to employ energy, how better to effect its transformation."

The achievements of science in this direction have enormously increased the productive power of men, and have lessened human drudgery. The development of the steam engine, the gas engine, the internal combustion engine, the electric dynamo, the utilisation of electric energy in manifold forms, the harnessing of the energy of falling water and its conversion into electrical and other forms of energy, and the concentration of chemical energy in explosives have immensely increased man's power over nature.

The great revolutionary changes in our industrial life—the great inventions which have altered the character of our civilisation—have arisen not as an effort to achieve results of immediate practical importance, but as a result of patient and persevering pursuit of knowledge for its own sake.

The invention of the electric dynamo was rendered possible only by the researches of Faraday, who revealed how the armature of a magnet swung round mechanically in a magnetic field and gave rise to an alternating current of electricity.

The X-ray tube arose as a result of the investigation of the nature of the electric discharge in gases, and not as a result of consciously directed effort to discover a means whereby we might, as it were, see through a brick wall or examine the internal structure of the living body.

The invention of the thermionic valve which led to the recent remarkable development of wireless, and the linking up of London and Melbourne by the wireless telephone, was rendered possible only by previous researches on the emission of electrons from hot bodies.

In the domain of biological science and preventive medicine, the achievements have been equally remarkable.

It was Pasteur who said that "In our century science is the soul of the prosperity of nations, the living source of all progress. What really leads us forward are a few scientific discoveries and their applications."

The work of Pasteur, indeed, is a striking exemplification of his own statement. His classical researches and discoveries on the cause of fermentation inaugurated a new era in the wine-making, brewing, and dairying industries, because he was the first to establish a controllable cause for fermentation and putrefaction, and for the diseases of wine, beer, and milk, which had from time immemorial baffled all attempt at cure.

The application of Pasteur's discoveries on putrefaction and fermentation to surgical operations at the hands of Lister revolutionised surgical practice, and banished for ever the torture of gangrenous wounds from the surgical wards of our hospitals.

The pébrine disease which first attacked the silkworms of France in 1849 caused the annual revenue of the silk industry to fall from 130,000,000 to 8,000,000 francs. The silk industry was ultimately saved by his scientific labours, for he was able to establish the cause and method of control of the disease.

Pasteur gave us the first definite knowledge of the bacterial origin of disease, and the production of immunity by vaccines. His application of this principle to the control of anthrax and hydrophobia was the culminating glory of his life.

Koch, in 1876, had shown how to isolate the organism of anthrax and cultivate it in pure culture outside the body. Pasteur confirmed these results and made an even more important discovery, namely, that by growing successive and continued artificial cultures the virus or poison of the organism became weakened or attenuated, and that if this weakened virus or poison is injected into the animal only a slight attack of the disease occurs and the animal is rendered immune from further attacks. The virus becomes a vaccine.

Many millions of sheep and cattle have since been treated for anthrax all over the world, and the rate of mortality has been reduced to less than 1 per cent.

As to the money value of these discoveries, Huxley has estimated that it was sufficient to pay the whole cost of the war indemnity paid by France to Germany in 1870.

The Pasteur Institute was founded as a national memorial to the illustrious man whose name it bears. That restless, tireless genius had saved France millions in treasure, and hundreds of thousands of lives. The silk industry, wine industry, dairying industry, stock-raising industry, medicine and surgery had felt the impress of his mighty hand.

Scorning the rich rewards which might have been his had he chosen to patent his discoveries, Pasteur deserved well of his country. The people understood and honoured him as few men have been honoured while they were alive. When one of the great newspapers opened a subscription list for a splendid memorial for an institution wherein Pasteur and his disciples might carry on their work under the most favourable conditions, the response was instantaneous. There was hardly a humble home in France which was not indebted in some way to Pasteur—there was hardly a home from which a subscription did not come. The wonderful Pasteur Institute was the result. Research workers come there now from every part of the world, and while the work of the Institute is now highly technical, it may perhaps be said that nowhere has so close an approach been made to the solution of the most intimate problems of hygiene, health, and of life.

Scientific research is not a luxury. From the purely materialistic point of view it is probably the cheapest form of investment that can be made. Germany in the nineteenth century provided a classic illustration of the manner in which a country, comparatively poor in natural resources, can, by the organised application of scientific research, grow rapidly in wealth and power.

When Schleswig-Holstein was torn from Denmark the Danes developed their systems of education and agricultural research with such success that they have become the world's object lesson in agricultural advancement.

Sir Richard Gregory, at the Capetown meeting of the B.A.A.S., said that "creative science, purposeful invention, and skilful labour are the three legs of a tripod on which industrial development rests. There can be no stability unless each foot stands firmly on the ground of common interest, and each bears its share of the structure supported by the combination. Without this triple alliance of the scientific investigator, alert manufacturer, and skilled operative, no nation can expect to be in the van of modern progress."

We are living in an age of rapid change and ever-growing complexity, and any industry or any country that is content to stand still is quickly left behind in the march of progress.

SCIENCE AND AGRICULTURE.

The foundations of agricultural science were laid long before governments took any part in its development. They were laid by men who pursued research for the love of knowledge—by such men as Liebig, Lawes, Kuhn, Pasteur, Mendel, Hellriegel, and many others. The past triumphs of agricultural research are familiar to many

of you, but in a gathering of this nature I may be pardoned if, for purposes of illustrating their economic bearing, I give a few examples of the far-reaching effects of the scientific discoveries of the chemist, the biologist, and geneticist.

The first great triumph was the introduction of artificial fertilisers, notably superphosphate, sulphate of ammonia, nitrate of soda, and potassic salts. These have added greatly to the productiveness of soils all over the world, and increased the output not only from crops but also from grasslands.

Superphosphate is of special interest to us because of the general deficiency of our soils in available phosphoric acid, and the extraordinary response which soluble phosphates give on wheat and grass lands.

Liebig was the first to draw attention to the fact that the insoluble tribasic phosphate in bones and rock phosphate could be converted into water soluble phosphate by treatment with sulphuric acid. In his report to the British Association in 1840 he suggested that this would be a suitable form in which phosphoric acid might be applied to crops.

Sir John Lawes, of Rothamsted, was one of the first to profit by this discovery, for he not only tested the efficacy of dissolved bones on his famous experimental plots, but began the manufacture of superphosphate from rock phosphate in 1842, and thus laid the foundation of the large fortune which he subsequently made and devoted to agricultural research. He established the Rothamsted Agricultural Experiment Station, one of the oldest and most famous agricultural research stations in the world, and left £100,000 for its endowment.

Since then the practice of using superphosphate has spread to every agricultural country. In no part of the world are phosphates so universally used as in Australia. Soluble phosphates are of special value to Australia, partly because of the common deficiency of Australian soils in phosphates, but also because it has been demonstrated that the application of soluble phosphates lowers the transpiration ratio and the water cost of producing dry matter in cereals and pasture plants, and thus increases the effectiveness of a limited rainfall.

The economic results to Australia of this simple discovery are difficult to assess, but for the wheat crop alone it is safe to say that its general use has increased the average yield of Australia by at least three bushels per acre—an increase worth annually £7,500,000 sterling to the Commonwealth.

Nitrogenous fertilisers are essential for the growth of crops and grassland in regions of heavy rainfall. In 1898, at the British Association for the Advancement of Science, Sir William Crookes predicted that the supply of natural nitrogenous fertilisers would soon become exhausted, and suggested the possibility of manufacturing these from the inexhaustible supplies of nitrogen in the air. Synthetic nitrogenous fertilisers are now manufactured in enormous quantities in Germany and Britain, and are being extensively used for intensifying producton from grasslands in Europe.

Pasteur's Work.

The achievements of Louis Pasteur have already been referred to. Some of his most fundamental and far-reaching studies had their roots in agricultural problems, and few men have had a more vital influence on the development of science in relation to agriculture. It is only necessary to recall his studies on fermentation in wine and vinegar making, on the serious troubles of silkworm culture, and on the several diseases of live stock, from which resulted some of his most epoch-making advances in science.

In discovering the cause and method of control of the deadly anthrax in stock he made one of the most fundamental additions to the etiology of disease; and in staging an extensive and successful experiment on anthrax under the auspices of the Melun Agricultural Society he compelled universal acceptance of his theory of protective vaccination, one of his greatest triumphs. His work on fermentation and on diseases of stock led to epoch-making contributions to bacteriology and immunology, and opened up a new world in combating infectious diseases.

Mendel's Law of Inheritance.

In 1865 Gregor Mendel, a monk of the Monastery of Brünn, in Austrian Silesia, formulated a law of inheritance which may be regarded as one of the greatest of biological discoveries. By his classical researches on the garden pea he was able to

show that when two distinct types of plants were hybridised the unit characters of each species were independently inherited, and that this was brought about by a segregation of the germ cells carrying the characters. Later researches have demonstrated that the chromosomes of the germ cells are the carriers of these heritable factors—the so-called genes of the biologist.

The presence of a small number of factors or genes carried with it the possibility of an enormous range of variation. Thus, with ten pairs of characters, there would be no less than 2^{10} or 1,024 distinct pure breeding forms produced by hybridisation, all of which could be isolated and raised in pure culture. Thus the almost infinite variety in Nature could be accounted for by assuming the presence of a comparatively small number of genes in the parent germ cells.

The Mendelian conception of unit characters, based on specific factors, transmitted in accordance with a definite scheme of inheritance, provided a scientific basis for breeding and a starting point for the modern science of genetics. By the recombination of the desirable characters contained in several varieties of the same species of plant, the plant breeder is now able to produce improved varieties of farm crops with a reasonable degree of certainty.

The principles have been applied with marked success with many varieties of crop plants, especially with wheat, and it is safe to say that the application of Mendel's principles to wheat breeding has added millions sterling to the wheat fields of the world, and has pointed the way to the ultimate production of varieties resistant to disease.

One of the earliest and most successful wheat hybridisers was William Farrer, of New South Wales, who, working in the Federal Capital Territory, produced Federation and many other prolific varieties of wheat. The Federation variety became so popular that Farrer may be said to have changed the colour of the Australian harvest fields from golden yellow to dull bronze—the colour of his own Federation wheat. The work of this pioneer wheat breeder, whose monument is to be seen in nearly every ripening wheat field of Australia, has resulted in increased production amounting to millions of bushels annually.

Similarly, the production of Marquis wheat in Canada by Dr. Saunders has revolutionised wheat culture in Canada, and it is estimated that the increased production of wheat in Canada due to this variety amounts to millions sterling per annum.

The mantle of Farrer has fallen on others, and thanks to their efforts almost the entire wheat belt of the Commonwealth is now sown with varieties which were unknown to the wheatgrowers a generation ago.

Breeding for Disease Resistance.

Apart from its application in the production of new and prolific varieties of wheat, there is reason to believe that the problem of producing disease-resistant types of crop ultimately will be solved by further applications of the Mendelian principle of inheritance.

An interesting illustration is the production of rust-resistant wheats. The estimated damage due to rust in the United States in 1916 was £60,000,000. In the same year the loss in New South Wales was estimated at £2,000,000. Careful research has established the fact that there are a large number of physiologic forms of rust. Stakman and others have shown that there are no less than fifty-five distinct biologic forms of rust, and that certain varieties are immune to some forms of rust and susceptible to others. Of these species of rust Australia has six indigenous forms, and one form which has been found in other countries.

Dr. Waterhouse, of Sydney University, has shown that the variety Thew was resistant to three of these biologic forms, whilst another variety, Canberra, was resistant to the remaining three. By crossing these two varieties he was able to produce a new variety, Euston, which was resistant to the six indigenous strains of rust. An American variety, Webster, was shown to be completely resistant to the introduced species of rust, and crosses between Euston and Webster have been made which now promise to be completely immune from the seven species of rust now found in Australia.

The problem of breeding rust-resistant varieties in Australia is much simpler than in other countries because of the comparatively few biologic forms of rust. The solution of the problem of rust-resistant varieties of wheat for Australia appears to be within sight, thanks to the patient research work of Dr. Waterhouse.

The Artificial Transformation of the Gene.

Most geneticists will agree that mutation forms the chief basis of evolution. Mutations have been a fertile source of improved races of plants. The history of the domestic cabbage and its cousins may be taken by way of illustration. When Linnaeus classified the plants of the world he gave the same specific name to the cabbage, cauliflower, kohl rabi, kale, Brussels sprouts, and to a wild plant inhabiting the Mediterranean region—namely, *Brassica oleracea*. The origin of these various forms of *Brassica oleracea* is not known, but there is little doubt that they arose from a common progenitor somewhat similar in type, but more mutable in character than the wild type of the Mediterranean.

All vegetative parts of the original species were evidently highly variable and mutable, for the cauliflower arose from a change in the inflorescence, the cabbage from a change in the leaf. Similarly, the mutation of the leaf buds, stem, and root produced respectively the Brussels sprouts, the kale, and the khol rabi. These mutations, as they appeared, were seized upon by man and perpetuated by cultivation.

Unfortunately, these discontinuous variations, or sports, caused by the mutations of the gene, occur with extreme infrequency under ordinary conditions. Hence the practical breeder has to be content with the recombination of the unit characters in his plants and animals by hybridisation or crossing, supplemented by an occasional mutational windfall, which gives him a basis for further development. There has been a widespread desire on the part of biologists to gain some measure of control over these mutational changes, and even to induce them artificially.

Quite recently Dr. H. Muller, of the University of Texas, appears to have demonstrated that in Drosophila gene mutation could be brought about by relatively heavy dosages of X-rays. Several hundred mutants were obtained in this species by this means, and they have proved to be stable in their inheritance for at least three generations.

Comparison of the mutation rates of irradiated and control Drosophila showed that in one case the mutation rate under irradiated conditions was 15,000 per cent. greater than in the untreated controls. Just what has taken place in this interesting experiment is difficult to say without further investigation, but if the X-rays has brought about the artificial transmutation of the genes—the bearers of heredity—and if it can be shown that gene mutation in plants or domestic animals can be induced by similar methods the economic importance of the discovery can hardly be over-estimated.

Control of Fungus Pests in Plants.

From time immemorial the cultivated crops have suffered from the ravages of fungus pests. Every country had a few, and with improvement in transport diseases were liable to be carried from one country to another. Moreover, under cultivation plants were more liable to disease than in the wild state.

The most destructive crop disease in the history of mankind was the ordinary potato blight (*Phytophthera infestans*). This was a native of South America and when it first reached Ireland, in 1840, it swept the country with all the vigour of a new pest, and caused widespread famine throughout Ireland. Once the disease appeared the farmer was helpless; there was no cure in sight. As Sir John Russell has said, "Of all the tyrants Ireland ever had the potato blight was the worst; it cost thousands of lives, untold suffering and misery, and millions in money." The life history of the fungus was worked out and a simple remedy was found—the spraying of the crop at appropriate periods with Bordeaux mixture—and now the blight is rarely heard of.

The "Smut" disease which has ravaged the wheat crop throughout recorded history was brought under control as soon as Kuhn, in 1858, showed that the fungus infection took place at the seedling stage, and that the smut spore adherent to the grain, but not the grain itself, was killed by a moderately dilute antiseptic. Now the wheatgrower secures complete immunity by pickling his seed with bluestone, formalin, or copper carbonate, at the cost of a few pence per acre.

Insect Pests in Plants—*Phylloxera.*

The dreaded phylloxera disease broke out in the Bordeaux district of France in 1863, and in less than twenty years the disease had spread so rapidly that the total damage done was £400,000,000—twice the indemnity paid by France in the Franco-Prussian war.

From France it spread through Europe, Africa, and finally to Australia. It broke out in Geelong in 1877, Bendigo and Rutherglen in 1898, and wiped out 30,000 acres of vines in Victoria, worth £2,500,000 to Victoria.

The French Government sent a scientific commission to America to study the pest in its native habitat. After prolonged investigation this Commission demonstrated that—

(1) While the phylloxera insect caused galls on the leaves of the indigenous American vines, it did not in any way affect the roots of the vines.

(2) The phylloxera did not attack the leaves and stems of the European vines, but completely destroyed the root system.

(3) Hence if the European vines—the fruit of which was so valuable for wine making and table purpose—were grafted on the roots of American species, the resultant plant would be immune from the attack of the phylloxera.

After much careful research work, involving years of trials of American root stocks, a species of Rupestris vine was selected as the best stock. The vineyards of France and Europe were reconstituted with these phylloxera-resistant stocks, and phylloxera is no longer a menace. The whole of the Rutherglen district has been replanted with phylloxera-resistant stocks, and experience has shown that the grafted vines are absolutely immune from attack and thrive and yield well in the phylloxerated soil.

Biological Control of Prickly-pear.

The spread of prickly-pear in Queensland affords the world's greatest example of the invasion of a plant pest or noxious weed, and a most interesting experiment on biological control of plant pests on a grand scale.

Prickly-pears were brought to Australia by the early colonists without their natural enemies, and remained exempt from injury by native insects. They therefore spread with amazing rapidity in their new environment. In 1925 the pear menace probably reached its climax when 60,000,000 acres of more or less fertile land in Queensland and New South Wales was infested with the pest.

There is no need to detail the efforts which Queensland has made in attempting to rid its land of this menace. Various methods of control have been tried—its eradication by mechanical means, by chemical agencies such as poisonous sprays, and by biological means—the use of insect and fungus enemies of the pear. The most hopeful is the method of biological control.

In 1919 the Governments of the Commonwealth, Queensland, and New South Wales agreed to co-operate in investigating the possibilities of applying methods of biological control. The Prickly-pear Board was established to undertake this work. The first step was to search the cactus world for all types of parasites and predators, import them, and acclimatise them, and test them against crops and other plants to prove that they would not be harmful to plants other than the Opuntias. After demonstrating the value of these pests as destroyers, the next step was to breed them on an enormous scale and distribute them.

A large number of promising pests have been introduced, acclimatised, and tested under great difficulties. Among these the caterpillar of a brown moth with the euphonious name of *Cactoblastis cactorum* has proved most successful and destructive. Its advent has justly given rise to great optimism. Over 2,000,000,000 eggs of this parasite have been liberated in the prickly-pear belt, and on present indications, it would appear probable that vast areas of prickly-pear land will be reclaimed by *Cactoblastis* and other insects. It is to be hoped that native parasites or disease epidemics will not impair the efficiency of these introduced predators.

The Prickly Pear Board and the Prickly Pear Land Commission, who are responsible for the scientific and administrative work, are to be congratulated on the progress that has been made, and if, as seems probable, complete control by these biological agencies is ultimately achieved, an area of land as large as England will have been reclaimed, and a scientific principle of the highest practical significance will have been demonstrated.

Intensive Sugar Production.

In Java science has been applied to intensive crop production with amazingly satisfactory results. The Dutch Government maintains a large Department of Agriculture with strong scientific branches, but in addition there are many private research institutions conducted for each of the more important estate crops, sugar, coffee, tea, rubber, and tobacco.

The sugar industry was the first in Java to seek scientific assistance, largely because of the appearance of the "Sereh" disease towards the end of the last century. The famous sugar experiment station, established by the sugar-growers

at Pasoeroan, in Eastern Java, affords a remarkable illustration of the manner in which a research institution can assist a staple industry. The sugar growers levy a rate of 4s. 9d. per acre on every acre under cultivation for the research work at Pasoeroan. This brings in an annual revenue of £120,000. The station has a large scientific staff of first-class men engaged on agronomic, chemical, botanical researches on all phases of sugar-cane production. Probably nowhere in the world is there such an example of primary producers supporting fundamental scientific research work on such a large and imposing scale as at Pasoeroan.

That the work of the station has been successful is shown (1) by the heavy levies willingly given for a quarter of a century—this shows that the growers have faith in the value of scientific research—(2) by the results achieved. Since the establishment of the research station in 1890, the area under sugar-cane has more than doubled and the yield per acre, notwithstanding the extension of sugar culture to much poorer land, has been increased from 70 to over 120 quintals per hectare—i.e., an increased yield per acre of 70 per cent. In other words, the total production of sugar has more than trebled in forty years. Forty years ago the whole area was planted with Black Cheribon, but this has been succeeded by improved varieties bred by the institute. The latest and greatest triumph is a prolific variety of high sugar quality and possessing great powers of resistance, known as 2878 POJ, which promises to displace all other cultivated varieties. The production of this variety is a genetical triumph, for it was produced by hybridising the cultivated cane with a wild species or glagah (*Saccharum spontaneum*), which contains a different number of chromosomes from the cultivated species.

REFRIGERATION.

The application of the principle of refrigeration to the carriage of perishable produce opened up a new era of progress for Australia. The first shipment from Australia was made in the "Strathleven," in February, 1880, with 34 tons of beef and mutton. Since then the development of refrigerated shipping has rapidly developed and now the average annual export of beef, mutton, lamb, dairy products, and fruit exceeds £15,000,000 sterling.

Much scientific work is being done at the Low Temperature Research Station at Cambridge to further improve the conditions under which the carriage of refrigerated meat and fruit is conducted. Australia has made a substantial contribution to the problem of carriage of apples by showing that the bitter pit of apples, which has been responsible for heavy annual losses, is caused by packing the fruit in an immature condition. Much work remains to be done to determine the best stage of maturity to harvest the various fruits, and to determine the most favourable conditions of temperature, humidity, and methods of ventilation of the fruit in the hold of the ship to eliminate disorders of the fruit due to transport. Eventually these problems attending the transport of fruit overseas will be solved, in which case a new era of prosperity will be ushered in for our fruit industries.

AGRICULTURAL MACHINERY.

The farmer has been greatly aided by the development of labour-saving machinery. A century ago it took a man 3½ hours to cut with sickle and thresh with flail a bushel of wheat. To-day the same work is done with a combined harvester in less than three minutes.

The modern harvester is the most efficient, labour-saving and economical machine yet developed for handling cereal crops, and its introduction has greatly increased the efficiency of labour at harvest. Australia is one of the few countries in which the climatic conditions permit this machine to be used with advantage, and it is largely owing to this fact that our wheat growers, although 11,000 miles from their market, can compete with the world in economic wheat production.

Babcock Butter Fat Test.

In 1890 Dr. Babcock, of the Wisconsin University, discovered a simple method of determining the butter fat content of milk. The principle of the method was that the casein of the milk was dissolved by concentrated sulphuric acid, and that the fat could be separated from the milk by centrifugal force. He devised a simple piece of apparatus which enabled the dairyman to find the butter fat content of milk in a few minutes. This simple discovery has meant much to the dairying industry. Not only has it enabled butter factories to use an exact method of payment for milk and cream, in accordance with the quality of the product, but it permitted a more careful control over factory processes than formerly, and resulted in an enormous saving of butter fat formerly lost in skim milk.

Moreover, the Babcock test provided the means whereby the dairyman could detect the unprofitable animals in his herd, and thus provided a scientific basis for herd testing. How much improvement was possible in this direction may be realised from the fact that whilst the average production of butter fat per cow in Australia is about 160 lb. per annum, Melba XV. of Darbalabra produced, in an official test, 1,614 lb. of butter fat from 3,252 gallons of milk—a tenfold increase over the average production for Australia.

LIMITATIONS OF AGRICULTURAL RESEARCH.

These are a few of many illustrations which might be given of the direct way in which scientific research has assisted primary production. But having stated a few outstanding cases, I must now hasten to give a word of caution. Scientific research applied to agriculture involves the patient and painstaking examination of agricultural problems, and its processes are necessarily slow. The non-scientific public is accustomed to view science as it might a volcano—prepared for the eruption of some new discovery from time to time, but accepting the effects of the eruption without realising the processes which led up to it during the previous period of quiescence. The period of preparation by research before science can offer to the world some new discovery may be long, but the scientific machine is always quietly running in the laboratory.

Moreover, agriculture differs from other industries in which a new discovery may be followed by a sudden transformation of the old. Agriculture is an age-old industry, slow-moving and conservative. The agriculturist deals with biological processes—with the production of plants and animals—and processes of production cannot be speeded up. As Sir Daniel Hall has said, "It still takes a wheat plant six or nine months to develop, and cows bring forth their calves neither more quickly nor more numerously than they did in the days of Abraham."

These limitations lie in the nature of the materials with which agriculture works, and though agriculture owes much to the application of science, we must not hope for revolutionary changes such as those witnessed in aviation and wireless. The life cycle of animals runs into years, and even in cropping a rotation of years must often be followed to get the full effects of any change of method. Hence the results of agricultural research are absorbed almost imperceptibly into agricultural practice unless the agricultural educational methods are well organised and thorough.

APPLICATION TO MAJOR PRIMARY INDUSTRIES.

A few illustrations have been given of the manner in which science and invention have assisted primary industries. We may now consider the manner in which scientific research may be applied in the development of our major primary industries. Broadly speaking, there are two ways by which primary production may be increased —firstly, by increasing the acreage under crop or carrying stock, i.e., by extending the margin of cultivation into drier areas; secondly, by increasing the efficiency of production within the areas at present in use by improving the output per acre and per animal.

In all States Governments have attempted to increase the agricultural output by bringing new lands under cultivation in areas of light and uncertain rainfall. This has involved heavy capital expenditure for roads, railways, water supply, and heavy loan expenditure for financing the settlers to establish themselves and to provide the expensive plant necessary for cultivation. It is doubtful whether much of this expenditure has been justified economically, taking into account the high capital costs involved in providing the necessary facilities and the low average returns secured.

The alternatve method of increasing production is by increasing the efficiency within the existing settled areas by increasing production per acre and per animal by the application of existing knowledge and the discovery of new facts which will enable further intensification of production to be brought about. The common task throughout the world is to wrest from reluctant Nature all that Nature can be made to yield. To increase the output from agriculture involves the intensification of production, and this can be done by *research* on the one hand and *education* on the other.

It is a matter of common observation that a wire fence often separates the grower of a 30-bushel wheat crop from the grower of a 10-bushel wheat crop. This difference in production is not due to difference in the productivity of the soil, but to differences in the skill and applied knowledge of individual farmers. In a recent survey of one of the richest dairying districts in Australia it was found that on almost identical soil some dairy farmers were securing 250 lb. of butter fat per cow, whilst their neighbours obtained less than 80 lb. per cow. Here again the differences in production were due not to fertility of the soil but to different skill of the farmers in the breeding, feeding, and management of the dairy cattle.

One of the great tasks of the Agricultural Departments of the State is to induce the many to do what the few are actually doing to-day. In other words, to induce the careless or indifferent growers to use the approved methods of cultivation which the majority of successful farmers now employ.

No matter from what angle the problem of agricultural education and research be viewed, it resolves itself ultimately into the problem of providing a sufficiency of agricultural specialists, investigators, and extension workers and using them in an organised scheme of research and education. This is the clear and unmistakable lesson to be learned from the efforts of other countries in their work of stimulating agricultural ddevelopment.

Trained research workers are needed for the investigation of the principles underlying the successful cultivation of crops and the feeding and management of live stock, and the principles underlying the control of diseases of crops and live stock. Trained and tactful extension workers are also required to get into close personal touch with those whose farms and animals are giving mediocre yields. This extension and educational work in agriculture is, and should be, carried out by the State Departments of Agriculture.

WHEAT, WOOL, AND DAIRYING.

The three great primary industries of the Commonwealth are wool, wheat, and dairying. A substantial increase in production could be brought about if the majority of cultivators could be induced to follow the methods practised by the most progressive farmers and pastoralists.

Wheat.

Take the wheat industry as an example. The wheat yield of South Australia for the period 1916-1926 was 12.44 bushels per acre, as compared with an average yield of 4.74 bushels per acre for the decade 1892-1901, notwithstanding the fact that the area under crop has been increased by over 50 per cent. by bringing under cultivation land in regions of light rainfall.

Similarly, in Victoria, the average yield for the same period has increased from 7.65 to 14.40 bushels per acre, an increase of 100 per cent. During the same period the area under cultivation in Victoria has been extended by the development of land in the drier mallee areas.

In the Wimmera district of Victoria the average yield during the same period has increased from 7.08 bushels per acre to 20.9 bushels per acre—i.e., it has been nearly trebled. Somewhat similar progress has been made in Western Australia and New South Wales.

In all Departments of Agriculture much research and extension work has been done in wheat. The main principles underlying successful cultivation of wheat have been worked out, but the standard practices suggested by this work are far from being carried out by the majority of the wheatgrowers.

The actual returns obtained by 12,738 wheatgrowers in South Australia for a normal season, 1926-27, averaged 12.87 bushels per acre. One thousand five hundred and thirteen farmers reaped less than 6 bushels per acre, less than half the average of the State, and 303 farmers reaped less than 3 bushels, or one-quarter of the average yield of the State.

On the other hand, 1,458 growers obtained an average of 24.6 bushels per acre, and 81 over 36 bushels per acre.

The efficiency of farming in the newer districts, as expressed by average yields, is naturally lower than those of older settled areas, but even in the latter areas of liberal rainfall and favourable soil the same range of efficiency was disclosed. In point of fact, as was shown recently,* the low average wheat yields are due mainly to neglect on the part of a large number of growers to follow well-established principles in cultivation—fallowing, thorough working of the fallows, liberal use of soluble phosphate, rotational cropping, choice of suitable varieties of wheat, and proper treatment of thre seed.

It is safe to say that, so far as South Australia and Victoria are concerned, the average yields of wheat per acre might be increased at least by 50 per cent. if all wheatgrowers followed in entirety the standard practices which are suggested by the research and demonstration work carried out by these States. This is one of the important problems in agricultural education and extension.

* A. E. V. Richardson, "Increased Efficiency in Wheat Production," Jour. of Agric., South Aust. (33, 297-316).

Still further increases will follow from any advances that are made in the control of fungus pests—take-all, footrot, flag-smut, and rust in wheat—which cause such appalling losses each year; the further developments in breeding improved wheat varieties; or in the determination of the physiological and morphological factors on which drought resistance is based. These problems can be solved only by intensive research.

Pastoral Industries.

Passing now to the pastoral industries—sheep, cattle, dairying—it may be said that practically the entire stock population, consisting of 100,000,000 sheep and 14,000,000 cattle, are maintained on the pastures. The output from the pastoral and dairying industries could be enormously increased if this large stock population could be (1) kept free from disease, and (2) adequately nourished, especially during periods of nutritional stress.

Animal Diseases.

Disease exacts a heavy annual toll from the live stock industries. Blowfly, liver-fluke, footrot, braxy, caseous lymphadenitis, and other diseases in sheep cause in the aggregate losses amounting to millions sterling annually. Similarly, in cattle, heavy losses are caused by worm nodules, tick, buffalo fly, pleuro-pneumonia, contagious abortion, mammitis, and tuberculosis. Time will not permit a detailed consideration of these pests.

Some of these pests—e.g., blowfly and buffalo fly—are being attacked by the Entomological Division of the Council for Scientific and Industrial Research, and many parasites are being studied with a view of combating these pests by methods of biological control.

The magnificent gift of Mr. F. D. McMaster of £20,000 for the establishment of a laboratory at Sydney University will enable research work on some of these important diseases to be undertaken, but the field to be covered is so vast and the issue so great that ultimately laboratories will need to be established at other centres to cope with the problems of disease affecting the pastoral industries.

Excellent work on animal diseases has been done by the Veterinary Research Station at Glenfield, New South Wales, but even the combined resources of Glenfield and the McMaster Laboratory will be insufficient to cover the wide field of investigation in a reasonable time.

Grassland Improvement.

The pasture lands of Australia provide the food supply of almost the entire stock population. The welfare of the stock is therefore ultimately dependent on the amount and nutritive value of the grass. No country is so dependent as Australia upon its pastures, and probably no country presents greater difficulties in the way of increased production from grass lands on account of the vastness of the areas, the diversity of soil and climatic conditions, erratic rainfall, liability to drought, all of which influence economic pasture production.

As only about 1 per cent. of the area of Australia is under cultivation, either with crops or sown grasses, it follows that for many years, and in the semi-arid portions perhaps indefinitely, the exploitation of the natural pastures must be looked upon as the main source of raw material for the pastoral industries.

The rational utilisation of the grassland resources is dependent upon a knowledge of the relationship of the various types of grassland herbage to one another and to the climatic, edaphic, and biotic factors which control them.

The first step is to classify the grasslands of each climatic and soil region in Australia according to the species of plants contributing to the pasture association, and to establish unit areas based on similarity in composition. The next step is to determine the extent to which each major grassland association may be modified by fertilisers, introduction of new species, and various forms of pasture management. With knowledge of such a nature available the work of developing grasslands would rest on a sound basis.

It must be borne in mind that the pastures of Australia over wide areas have seriously deteriorated in value. Prior to settlement the herbage of Australia was in equilibrium with a light grazing marsupial fauna. The advent of the white man with his flocks of sheep and cattle, his droves of rabbits, and the numerous plant immigrants, some useful but many noxious, that followed closely on his trail, upset the age-old balance of vegetation. The balance was further disturbed by occasional overstocking, accentuated by drought.

Little wonder that many of the valuable and palatable indigenous species have disappeared, that noxious weeds from other lands have rapidly spread themselves, and that the pastures have deteriorated in carrying capacity. Moreover for several generations there has been a continual drain on the pastures to supply the mineral nutrients required for the bony framework of the animals sold off the farms to supply the cities with food and raiment. In many parts of Australia this depletion of the soil in mineral nutrients, and particularly in phosphates, has been reflected in the condition of the stock, and the so-called deficiency diseases, or malnutrition, as evidenced by bone-chewing, are the result.

I made a calculation some years ago for the rate of depletion of phosphates from pastoral properties in Victoria, and showed that the equivalent of 1,800,000 tons of superphosphate had been removed from the pastoral properties of Victoria in the form of slaughtered animals and animal products during the last sixty years. Many million tons of phosphates would be needed to bring back the phosphate content of the pastoral soils of Australia to what they were at the beginning of settlement.

Viewing the grasslands of Australia as a whole, comparatively little attention has been devoted in the past to those intensive methods of animal production which characterise the practice of older countries—namely, the use of seeded pastures, improvements by topdressing with phosphates and nitrogenous fertilisers, conservation of the surplus growth for use during periods of nutritional stress, and improved methods of pasture management. Nevertheless, the change from extensive to intensive methods of production is making considerable headway, especially in the southern grassland region.

We may consider briefly some of these avenues of improvement.

Sown Pastures.—Some 4,500,000 acres, mostly in the coastal and elevated areas of Australia, have been sown with grasses. This area is quite insignificant in comparison with the area of Australia, or even the area of sown grassland in England. There is room for an enormous expansion in the area under seeded pastures, which normally exceed in carrying capacity and nutritive value the indigenous pasture which it replaces.

The remarkable transformation of the coastal areas of New South Wales and Queensland by the introduction of the Brazilian pasture plant (*Paspalum dilatatum*), and the equally remarkable effects of the introduction of Subterranean clover in the better rainfall country of South Australia and Western Australia, are illustrations of the greatly increased carrying capacity following on the introduction of superior types of pasture plants for specific environments.

The New South Wales Department of Agriculture has done much valuable work in demonstrating how production in the better rainfall areas may be increased by replacing indigenous vegetation with seeded exotic pasture plants. One of the activities of the Division of Plant Industry of the Council for Scientific and Industrial Research is the organisation of a plant introduction service whereby improved fodder and pasture plants from other parts of the world will be introduced and thoroughly tested out in co-operation with the State Departments of Agriculture in various parts of Australia.

Top Dressing.—The top dressing of pastures with artificial fertilisers provides a means of greatly increasing the output of grass regions of liberal rainfall. In the light of numerous investigations in several of the States, it is safe to say that the carrying capacity of pasture lands in regions of heavy to moderate rainfall can be more than doubled by top dressing with soluble phosphates at a comparatively trifling cost. While there has been a gratifying development in the practice of top dressing in the southern grassland region during recent years, it may be said that there are enormous areas of grassland—many millions of acres—in the higher rainfall areas of Australia which have never yet received a dressing of artificial fertiliser.

The investigations have shown that the productivity of the pasture is greatly increased by the application of phosphates; the quality of the pasture is improved both in protein and minerals largely by the stimulation of leguminous plants in the sward; and that the health, vigour, and fertility of the grazing animals have been vastly improved. Investigational work, moreover, has shown that the chemical composition of a pasture is a reflex of the soil on which it is grown, and that soils deficient in phosphate produce phosphate-starved grass, which in turn produces in grazing animals the characteristic symptoms of malnutrition and the deficiency diseases so frequently met with in Australia.

Apart from the use of phosphates, there remains the very important problem of determining the rôle of nitrogenous fertilisers in intensifying production from grasslands, especially on the sown pastures in the regions of heavier rainfall.

Mineral Licks.

In areas of light rainfall where economic considerations do not permit the use of top dressing, phosphate deficiency in the pasture may be corrected by allowing stock free access to mineral licks. The supplementing of the pastures with mineral licks has been fairly common in certain districts of Australia, particularly in Queensland, New South Wales, and Western Victoria, but the practice of using licks needs to be placed on a sound basis by ascertaining the major mineral deficiencies in each grassland region and adjusting the composition of the lick to the ascertained deficiencies in the pasture, and to the special needs of the grazing animals. The requirements will vary in the different grassland areas, and probably reach a maximum just before the normal break in the season.

Pasture Management.

Much might be said, did time permit, regarding the recent work in Britain, Germany, and New Zealand on the intensive system of grassland production in regions of heavy rainfall.

Recent work at Cambridge has revealed the fact that dried young herbage from a pasture has a mineral and protein content approximating that of the best concentrated stock foods, and that if pastures can, by controlled grazing and pasture management, be kept in a young leafy condition, the production of milk can be greatly stimulated.

Intensive methods of pasture management are being applied with great success in New Zealand, and the output of dairy products from that Dominion have increased by leaps and bounds during recent years. In the aggregate, the area of rich land available for such methods of grassland production is greater than the area available in New Zealand.

The output from the dairying industry, which is mainly located in the heavier rainfall areas, could be tremendously increased, apart from herd testing and better methods of breeding, through the more extended development of seeded pastures, the wholesale use of artificial fertilisers, the more general adoption of improved methods of pasture management, and the utilisation of the wonderful flush of grass towards the climax of the growing season.

Supplementary Feeding During Periods of Nutritional Stress.

Mature herbage has been shown to be of much lower nutritive value than young herbage, which is particularly rich in proteins and minerals and low in indigestible fibre. Mature dry herbage rapidly deteriorates in the field because of the leaching of soluble nutrients by dews and rain, the spread of fungi, shedding of seed, and the loss of leaf by wind and the trampling of stock. The fibre content of such herbage becomes high in proportion to the protein and mineral content, and the nutritive value of the herbage very low.

The Division of Animal Nutrition of the Council of Scientific and Industrial Research has been engaged on work of fundamental importance to the wool industry. It has shown that a most important constituent of wool is the sulphur-bearing ammo-compound known as cystine. The Division has demonstrated that ''wool break'' is usually caused by nutritional distress brought about by a diet deficient in cystine, and that this break in the fibre may be obviated by supplementary feeding with cystine rich proteins.

Moreover, some very important results have been recently obtained at Meteor Downs, in Queensland, on the effect of cystine rich foodstuffs used as a supplement to the pastures. The supplement chosen was sterilised blood meal. Two groups of lambs, each consisting of 100, were grazed in equal sized paddocks. The lambs receiving a supplementary diet of blood meal at the rate of about ½ oz. per day produced an average of 20 oz. extra wool than the lambs receiving no blood meal. The cost of the supplementary feeding averaged less than 10d. per head.

The net result, therefore, at this particular station was that 20 oz. of wool per sheep were obtained for an expenditure of less than 10d.

The Division is now engaged in a search for rich cystine-bearing material to use as supplementary feeding for sheep.

THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

It is clear from what has already been stated that there is wide scope for scientific research into the problems which limit production from the primary industries. The Commonwealth Government established the Council for Scientific and

Industrial Research to initiate and carry out scientific researches for the promotion of the primary and secondary industries. As the primary industries were of such outstanding importance to the welfare of the States and the Commonwealth, the main efforts of the Council have been directed to the scientific problems associated with primary production.

From its inception the Council sought to co-operate and collaborate with State Departments of Agriculture and Universities in the development of this important field of research. It convened a representative conference of these bodies in 1927 to consider the relative spheres of the Council and State Institutions in regard to Agricultural Research. The conference decided that in view of the number and magnitude of the problems confronting the agricultural and live stock industries of Australia, Commonwealth participation in agricultural research was desirable, and indicated many fields of work in which research might be conducted on a national basis—e.g., animal diseases, animal nutrition, plant pathology, entomology, and soil research.

The Council for Scientific and Industrial Research appointed a standing Committee on Agriculture comprising the permanent heads of the State Agricultural Departments, to ensure complete co-operation and collaboration with State institutions in the development of agricultural research in Australia.

It was recognised that there need be no overlapping of effort of Commonwealth and State activities if the Commonwealth restricted its efforts to the major problems affecting great climatic regions rather than political boundaries—the more or less national and fundamental problems of nutrition and disease in crops and stock and on soil problems and forest products research—whilst the States continued their work on problems of special local importance and interest, and to the application of the knowledge gained to the improvement of practice.

Six divisions have been established to attack major sections of the work, each being under the control of an eminent authority. The Divisions already established are animal nutrition, animal health, plant industry, entomology, soil science, and forest products. The shortage of scientific personnel adequately trained in directions necessary for the investigation of Australian problems has been a serious factor militating against progress. The effect of the world-wide movement for the greater application of science to industry that has taken place since the war has resulted in an acute shortage of research workers trained in sciences broadly classed as biological. Nevertheless, the progress made by these Divisions has been very satisfactory, and the results of the work have been made available in the publication of the Council for Scientific and Industrial Research.

Co-operation has not only been sought with State Departments of Agriculture and the Universities, but a close link has been forged with British Research Institutions through the Imperial Bureaux and the Empire Marketing Board. A large appropriation has been made by the Empire Marketing Board towards the testing out by Australia on a large scale the possibilities of biological control of insect pests and noxious weeds. The results of this co-operative investigation will be of great significance not only to Australia, but to the whole Empire.

The advent of the Council for Scientific and Industrial Research into the field of agricultural and pastoral research should stimulate and assist the development of research in State Departments of Agriculture and Universities.

STATE DEPARTMENTS OF AGRICULTURE.

It would be difficult to assess the immense value of the research and extension work conducted by the Departments of Agriculture, and the effect of this work in developing the agricultural industries.

The marked advances that have been made in the wheat industry during the past decade is one striking illustration of the success which has attended their efforts in the direction of research and extension. These State Departments should be encouraged to develop their research work to the utmost extent, because it forms the only basis on which a rational system of extension and propaganda work in agriculture can be developed. In the enthusiasm to promote agriculture, a State may be tempted to encourage extension and propaganda work without providing a sound and adequate basis for such propaganda through research. Such efforts are bound to fail because experience elsewhere has shown that research and then demonstration must always precede propaganda. American agricultural institutions completely failed to influence the farming classes until a sound basis for teaching and extension had been accumulated through the work of the Agricultural Experiment Stations.

It is recognised elsewhere that the modern agricultural State must cultivate agricultural research and extension if it is to survive in world competition with its agricultural products. The clear lesson of experience in all great agricultural countries of the world is that a permanent increase in the output from the land can only be achieved by applying the results of research and the teachings of science to every branch of primary production. As production from the agricultural and pastoral industries becomes more intensive and diversified there will be an increasing demand for knowledge of the principles underlying agricultural and pastoral production, the methods of controlling crop and animal diseases, and this demand can be satisfied only by the further development of the facilities for research and extension work in agriculture.

CONCLUSION.

In other countries a strong national sentiment has been developed towards agriculture. The administrators of agricultural countries such as the United States, Canada, South Africa, Denmark, Japan, and Java, not only believe that agriculture is the basis of the country's wealth, but they translate this belief into action and legislation. These nations think in terms of agriculture. This attitude finds practical expression in the liberality with which agricultural research is supported and the readiness with which these countries map out policies for steady, continuous development over long periods.

Australia has the most varied conditions of agriculture of any single political unit in the Empire—a climatic range from tropical to temperate conditions, from highly humid to very arid conditions—with a corresponding variety in production. Moreover, it is a country of continental dimensions with a relatively sparse population enjoying a high standard of living. The full development of its agricultural resources can be realised by maintaining high efficiency in output of agricultural produce per man, by the use of labour-saving machinery, efficient methods of production, and applying all the resources of science to the cultivation of the land and the raising of livestock.

In view of the importance of the primary industries to national welfare, it is highly desirable that our resources should be conserved by the best methods known, that they should be developed to the highest degree attainable, and that the conception of an organised agriculture based on development through research and education should be part of the mental equipment of every statesman and administrator.

SURVEY OF QUEENSLAND SOILS.

The Secretary for Agriculture and Stock, Mr. H. F. Walker, M.L.A., announced recently that Mr. J. R. Taylor, M.Sc., Commonwealth Soil Survey Officer attached to the Council for Scientific and Industrial Research, had just completed a visit to Queensland which had extended since 5th May last. His visit was consequent on an invitation from Mr. Walker for the purpose of advising his Department upon matters connected with the future soil investigation of Queensland, with particular reference to a suggested soil survey of certain areas likely to be later available for development. In the first instance Mr. Taylor, accompanied by Dr. Kerr, Soil Technologist to the Bureau of Sugar Experiment Stations, Mr. G. B. Brooks, Senior Instructor in Agriculture, Mr. N. King, of the Agricultural Chemist's Branch, visited the Mackay district, where four days were spent on the Eungella lands, as well as all the cane areas within a radius of about 10 miles of Mackay. In the latter areas the various types of soil on which sugar-cane is growing were specially examined. Mr. Taylor next proceeded to the Dawson Valley, spending about a week there, mainly in the Theodore zone. On his return to Brisbane some days were spent at the Congress of the Australasian Association for the Advancement of Science, and Mr. Taylor's next journey was to the district between Roma and Toowoomba, with the special object of looking into the possibilities of the extension of wheatgrowing in the section to the west of Dalby, and south of the railway line between Dalby and Roma. Mr. Taylor has returned to his headquarters at the Waite Institute, Adelaide. He will later furnish a report to the Minister embodying his observations and suggestions for the carrying out of soil survey work in Queensland.

CLIMATOLOGICAL TABLE—MAY, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·00	82	70	88	3	50	31	449	12
Herberton	..	72	58	80	8	52	22	223	14
Rockhampton	30·13	77	60	85	11	50	15	478	11
Brisbane	30·22	72	57	81	12	50	15	798	15
Darling Downs.									
Dalby	30·23	71	47	78	11	34	15	221	7
Stanthorpe	..	63	44	69	5,18	28	17	284	13
Toowoomba	..	63	47	73	16	35	15	550	13
Mid-interior.									
Georgetown	29·99	86	63	92	7,11	55	3,4,5,6	30	2
Longreach	30·11	78	54	86	11	44	15	302	4
Mitchell	30·20	70	46	81	11	33	18	174	6
Western.									
Burketown	30·02	86	63	94	11	59	16,20, 21,22	47	2
Boulia	30·09	80	51	89	6,7	39	15	17	1
Thargomindah	30·18	71	51	81	11	41	16	53	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1930.	May, 1929.
North Coast.	In.		In.	In.
Atherton	1·89	29	3·77	1·29
Cairns	4·32	48	6·07	1 96
Cardwell	3 45	58	6 52	1·61
Cooktown	2·84	54	4·52	0·71
Herberton	1·57	43	2·48	0·81
Ingham	3·24	38	8·08	0·76
Innisfail	12·05	49	22·91	3·77
Mossman	3·32	17	6·49	2·36
Townsville	1·26	59	4·48	0
Central Coast.				
Ayr	1·05	43	3·00	0
Bowen	1·24	59	5·73	0
Charters Towers ..	0·73	48	3·75	0
Mackay	3·67	59	7·92	0·34
Proserpine	4·22	27	5·87	1·06
St. Lawrence.. ..	1·71	59	5·96	0
South Coast.				
Biggenden	1·70	31	2·34	0
Bundaberg	2·61	47	3 37	0·31
Brisbane .. .	2·83	78	7·98	0·42
Caboolture .. .	2·77	43	8·38	0·47
Childers .. .	2·10	35	3·16	0·22
Crohamhurst .	4·74	37	15·58	0·89
Esk .. .	1·94	43	5·27	0·14
Gayndah	1·49	59	5·90	0
Gympie .. .	2·85	60	4·42	0·12
Kilkivan .. .	1·80	51	4·14	0
Maryborough .	3·04	58	5·66	0·25

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1930.	May, 1929.
South Coast—continued:	In.		In.	In.
Nambour	4·69	34	8·87	0·72
Nanango	1·47	48	3·47	0
Rockhampton ..	1·40	43	4·78	0
Woodford	2·82	43	9 04	0·44
Darling Downs.				
Dalby	1·29	60	2·21	0·12
Emu Vale	1·10	34	2·39	0·31
Jimbour	1·17	42	2 21	0·03
Miles	1·46	45	3·22	0
Stanthorpe	1·84	57	2·84	0·23
Toowoomba ..	2·14	58	5·50	0·05
Warwick	1·52	65	2·86	0·09
Maranoa.				
Roma	1·41	56	1·97	0
State Farms, &c.				
Bungeworgorai ..	0·75	16	2·00	0
Gatton College ..	1·55	31	3 25	0·07
Gindie	0·86	31	3·76	0
Hermitage	1·11	24	2·52	0·09
Kairi	1·68	16	4·50	0·50
Mackay Sugar Experiment Station ..	3·15	33	7·88	0·35
Warren	0·83	15	..	0

GEORGE G. BOND, Divisional Meteorologist.

STANTHORPE FRUIT INDUSTRY.

REPORT FOR THE 1929-1930 SEASON.

The Director of Fruit Culture, Mr. George Williams, has received the following report from Mr. H. St. John Pratt, Instructor in Fruit Culture:—

As anticipated, the Stanthorpe fruitgrowers have not had as prosperous a season this year as last when prices for all classes of fruit and vegetables were abnormally high, especially in Sydney, and Stanthorpe reaped the benefit. This year, prices although considerably lower than last year are still above the average, and the note of pessimism sounded in some quarters is due to the fact that certain growers have been inclined to take last season as normal whereas it was decidedly abnormal.

A Year of Abundance.

This season the growers of early stone fruit did exceptionally well up to Christmas, but after the New Year prices were disappointing for all classes of fruit and still more so for vegetables.

This season has been one of abundance and plenty for all classes of fruit and vegetables, not only in Queensland but also in New South Wales.

In Stanthorpe there has been a large crop of all varieties of fruit—apples, pears, peaches, plums, and grapes, as well as vegetables.

This seldom happens, usually if there is a heavy stone fruit crop, then the apples will be light, or if they be heavy then perhaps grapes will be light, but the season 1929-30 will be remembered as one when all classes of fruit cropped exceptionally heavily.

Of course the best condition from a Stanthorpe point of view arises from a dry season elsewhere with a moderate rainfall in Stanthorpe.

Prices.

Although prices, generally speaking, have been much lower than last year, yet many growers have done as well as last year; especially those who have established for themselves private markets. This avenue of disposing of produce is being exploited more every year with ever increasing satisfaction to both producer and consumer. There is also an increasing delivery of fruit and vegetables to the Northern Rivers of New South Wales per media of motor lorries.

The glut in fruit and vegetables and consequent low prices is to some extent due to the coal strike in New South Wales and the prevailing unemployment. Men out of work with no immediate prospect of obtaining it very often start a garden and not only grow their own requirements but also a surplus which they sell—in fact, they become market gardeners on a small scale.

Improved Cultural Practice.

Although there is still room for improvement, a better class of fruit is marketed each year from Stanthorpe—more thinning out was done for last season than the previous one, and the large crop just experienced has still more forcibly brought home to many growers the absolute necessity of only growing and marketing the very best of fruit and vegetables.

There is proceeding in Stanthorpe the gradual elimination of the worthless and poorer varieties of fruit. A large number of trees were reworked last season, and from inquiries at the office it is apparent that an even larger number will be reworked this year. Needless to say this elimination must be gradual as the average orchardist cannot afford to put too many trees out of commission, as it were, at once. This office serves quite a useful purpose in collecting and distributing scions of approved varieties from specially selected trees of the various varieties for this purpose.

Pest Control.

The chief outstanding feature of the year has been the remarkable absence of fruit fly. It is quite safe to say that there has been considerably less fruit fly this year than in any year for the last ten years.

The fly made its appearance all over the district last November as usual, but the orchardists were careful to immediately pick off and destroy all infected fruit, with the result that there has been this year a minimum of fly.

Of course other agencies may have been at work which prevented invasions of fly from other districts, but, generally speaking, the Stanthorpe orchardists have done their part as to fly control.

The same, however, cannot be said as to Codlin Moth. There has been far too much moth in the district this season, and the growers together with the officers of the Agricultural Department must view this problem very seriously. It is a pest

that can be controlled and, generally speaking, any grower who is more or less free from moth can take all the credit to himself, and, conversely, a grower who has suffered severely must at least take most of the blame.

A very large crop of grapes has been harvested, due to a great extent to the weather being so very favourable to grape production—a fact which accounted largely for the almost entire absence of disease. In fact the weather has been almost too good as the careful grower has not reaped the benefit that he usually does (and is justly entitled to) over the grower who is not so assiduous with his spraying and other field operations for the prevention of disease.

Oversea Export.

The export of fruit from the Summit district to the East has also been an outstanding feature of the past season. The Producers' Distributing Co-operative Society, which is the fruit section of the Coastal Farmers' Sydney, purchased 2,500 bushels of apples from the Summit district in late January and early February, and exported them to the Fresh Fruit Receivers Limited, Singapore, for whom they are the Australian agents. This fruit arrived in good condition, also a trial consignment of pears, peaches, English and Japanese plums, thereby successfully demonstrating that all these classes of fruit can be exported to the East provided that sufficient care is taken in the grading and packing together with due regard to picking at the right time.

The P.D.S. Co. is keenly interested in Stanthorpe stone fruits as well as apples on account of both their fine quality and earliness, and it is confidently expected that increased consignments will be exported to the East this coming season.

The greatest care and supervision must be taken with such orders because Stanthorpe is up against an established and strongly entrenched United States of America market, and one consignment of inferior fruit or fruit arriving in bad condition would probably spoil this market for many years to come. Also 200 cases of apples were exported to Colombo and 100 cases to Hamburg as a sample consignment to test out these markets.

Another outstanding activity of the year was the establishment of a community packing house by the Committee of Direction at the Summit.

The deciduous section of the Committee of Direction having a sum of money to its credit the question arose as to how a portion of it could be spent in the best interests of the section. As marketing of the fruit appeared to be the operation requiring the greatest help, and it was thought by the district that packing houses would improve the operation, the Committee of Direction was asked to build a packing house in what it considered the most favourable locality in the district for that purpose. Eventually the Summit was decided on as the site, and the successful packing of apples the objective. Unfortunately the shed was not completed and ready to receive fruit before 15th January, by which time most of the early apples had been harvested, and so the season for the packing house was considerably curtailed. However, in spite of this and the setbacks which always attend a new venture, more especially one where co-operation is essential, the packing house has justified the experiment being made. The growers supplying it have expressed their satisfaction with it and its management, and it is expected and hoped that other districts will be requesting the same assistance from the Committee of Direction, and eventually there will be a chain of packing houses throughout the district selling Granite Belt fruit under the one brand.

The Marketing of Immature Fruit.

The marketing of immature and undersized fruit still remains a problem. Growers who persist in the practice are not only doing no good themselves but are a serious menace to the more intelligent orchardist who takes a pride in the quality and get-up of his produce.

The Coming Season.

The planting of new trees promises to be heavy this season. Good orchards are not for sale and the prospects for the coming year and the future of the industry are, I consider, good. The more successful orchardists are extending their areas under trees.

Successful Queensland Exhibitor at Hobart.

A report on the district would not be complete without a brief reference to Mr. Douglas Gow, who exhibited the other day so successfully at the Fruit Exhibition held at Hobart in the "Colombic Cup" competition or Grand Championship of Australia. All the States except Western and South Australia were represented in

this championship, the entries being eight from Tasmania, two from Victoria, and one each from New South Wales and Stanthorpe. The class was for five varieties of apples, one case of each, and Mr. Gow came 3rd with 432½ points out of 500. The winners gained 439½ points and 436½ points was second. Thus it will be seen that Gow was only 7 points behind the winner, or just over 1 point per case behind. When it is realised that the Southern fruit was practically exhibited direct from the tree, whereas that from Stanthorpe had to be held in cool store for six weeks, and then put up with eight days transport by rail and boat, it must be conceded that there is not much wrong with the Stanthorpe fruit and that it can hold its own anywhere. Mr. Gow is congratulated on his success, and the best thanks of the community are accorded him for advertising this district so forcibly and attractively.

THE THIN-SHELLED QUEENSLAND NUT.

By GEORGE WILLIAMS, Director of Fruit Culture.

The Queensland Nut (Macadamia) indigenous to the south-east coast lands of this State and to the north-east part of New South Wales provides excellent opportunity for the establishment of a profitable industry—apathetically neglected up to the present in favour of exotic perishable products more or less subject to disease to which the Macadamia so far as is known is immune.

Several types of nuts are produced upon trees of varying habit from the small spherical hard-shelled specimens which were found in the scrub lands mainly from Brisbane north and as far as Bauple. The small tree by which these are produced is of compact growth with usually small, glossy green foliage upon which the spiney borders are almost or entirely absent, more particularly on the older trees. The small white inflorescence is supported on short pendicles and seldom followed by more than two nuts, usually one. In the large fruited varieties the flowers are generally shaded with pink and the pendicles admit of carrying up to two dozen nuts. (The specimen illustrated, of the thin-shelled type, carries nineteen, produced on a four-year-old tree, not grown under very favourable conditions). Messrs. J. W. Waldron, of Eungella, and S. M. Greer, of Upper Dungay, have given much attention to improvement by selection, resulting in very fine types being now available. The thin-shelled, which succumbs under the pressure of ordinary nut crackers, is of medium size. A much larger type which may be readily opened with a pocket knife has been named "ever-bearing" on account of its productivity. Though variations are noted in the foliage of seedling trees, particularly the thin shelled, the principal features of their products do not seem to vary. The trees are more vigorous and productive than the small hard type and attain much greater dimensions.

Though indigenous and hardy under favourable conditions the Macadamia is subject to injury by heavy frost and will not thrive in a soil in which drainage is deficient. Its natural habit being fertile scrub lands it naturally follows that cultivation should follow upon similar soils or those nearly akin to them. Many of our banana plantations, which are not reasonably adapted for the production of other crops and are comparatively valueless after the profitable term of the bananas has been reached, could be interplanted with Queensland nuts which as they develop would give a most satisfactory return for a minimum of expense. Interplanting between bananas could be considered in plantations where all cultivation is effected by hand tools. The young trees will thrive under partial shade and would be several years in advance of those planted after the bananas were defunct.

The distances allowed between plants could be carried somewhat to fit in with other operations, a range of 24 to 30 feet apart would cover most situations. The average age at which the young trees become reasonably productive is about eight years. This appears a long distance ahead, but when compared with several fruit crops which entail general cultivation and suppression of disease for a minimum of five years before being reasonably productive, the advantage is much in favour of the nut whose crops are matured with a minimum of attention and can be held for a favourable market if so desired. There can be no question regarding market prospects; the quantity of nuts imported will dispel any doubts, and it may also be mentioned that inquiries have been received from overseas for quotations for up to 20-ton lots. The yield from developed trees varies from 50 to 150 lb., the few trees from which the nuts are sold in Brisbane averaging a cash return of £4 to £5 per annum. Allowing that a reduction of 33⅓ to 50 per cent. resulted as an effect of heavy production (a position which is extremely unlikely), the net return from the expenditure of an equal amount on any of our fruit tree crops would not show the nut to disadvantage.

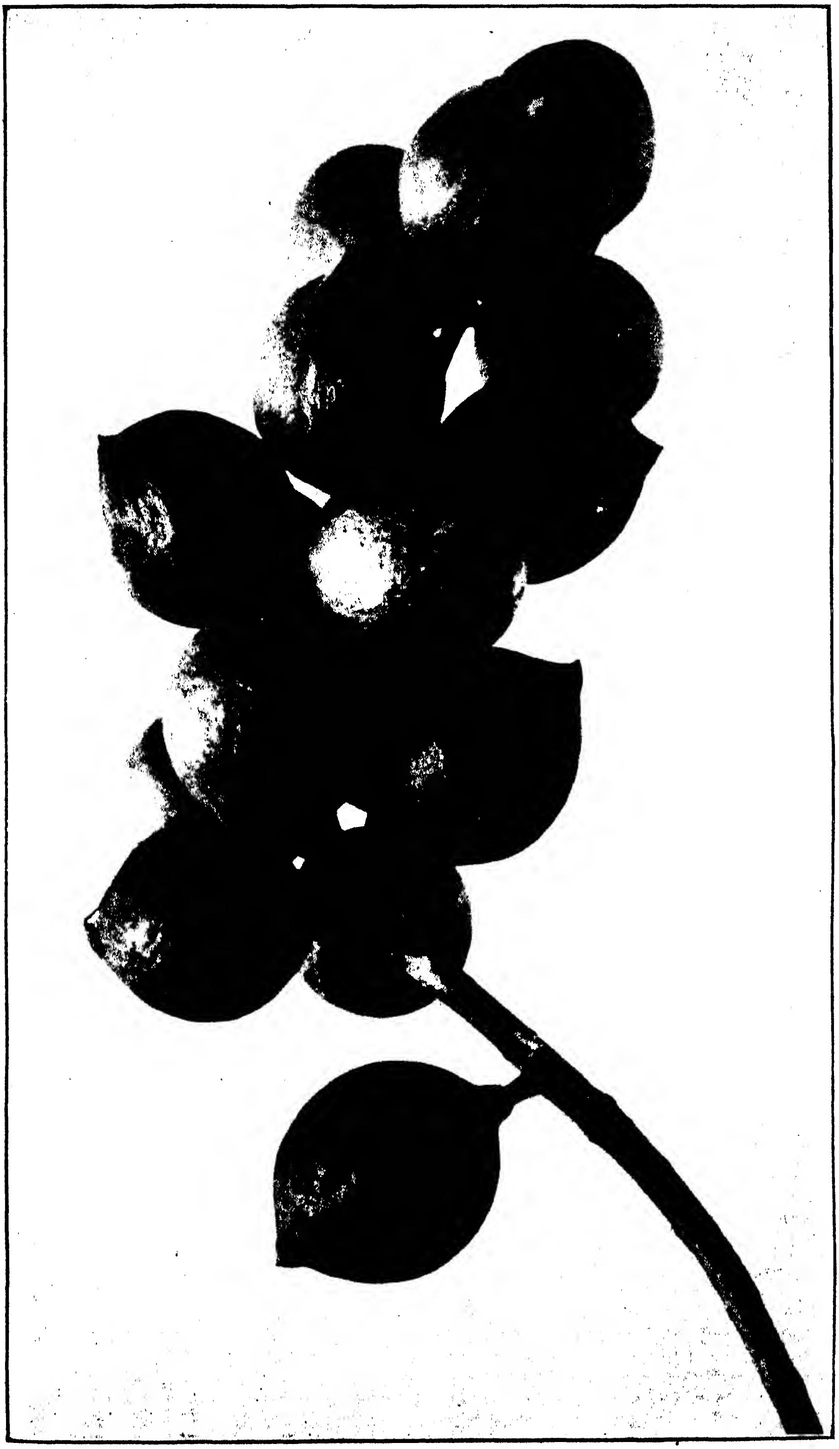


PLATE 2.—A CLUSTER OF QUEENSLAND NUTS, THIN-SHELLED VARIETY.

THE COTTON INDUSTRY.

The Minister for Agriculture and Stock (Hon. H. F. Walker) made the following announcement recently:—

FOLLOWING on my recent trip of inspection through the Burnett, Callide Valley, and Wowan-Dululu areas, I have been in consultation with the Cotton Specialist of the Department regarding the carrying out during the coming season of a comprehensive set of varietal trials which will test out the possibilities of all cottons now under investigation. It appears by the results which have been obtained this season from the test plots and varietal trials that some of the varieties which have been imported by the Department may give more satisfactory results during abnormal seasons than does the Durango cotton, which is the main variety being grown at present. This applies particularly to some of the districts where either heavy rainfall or droughty conditions may be experienced at critical times in the development of the plants.

Varietal Trials.

The failure of the Durango variety to give satisfactory results under abnormal conditions was stressed at several of the meetings at which I had the pleasure to meet the cotton-growers in the districts mentioned. I advised at the time that the matter would be gone into very carefully, and now wish to announce that during the coming season a large series of varietal tests will be carried out with grower co-operators in the different cotton-growing areas of the State. These tests will be designed so as to allow of the obtaining of the most accurate information concerning the value of the varieties to the different districts. I wish to stress at this point, however, that the experiences in all other cotton-growing countries indicate the desirability of growing as few varieties as it is possible to carry on with, and the absolute necessity of growing only one variety in a district. Where two or more varieties are grown within a section, not only does contamination of the varieties take place through admixture of the seed in the ginnery machinery, but also through cross-pollination in the field by various insects. We have already had one experience in Queensland with the results to be obtained by growing a variety of mixed origin, and it is hoped that all growers will realise the necessity of growing only the one variety in a distret.

Imported Seed.

As promised to a deputation of the Queensland Cotton Board, consideration has also been given to the importation from the United States of America of seed of medium stapled varieties, and which are quicker maturing than is Durango. Following on a conference with the manager of the Cotton Board and the Cotton Specialist of the Department, it was decided to import a half-ton each of seed of two varieties which appear to have possibilities under Queensland conditions. In addition to these, 100-lb. lots of seed of eight other varieties are also being obtained. Every precaution will be taken to make this seed free from insect and fungoid diseases. The seeds will also be planted in isolated quarantine areas, so the danger of introduction of serious pests or diseases into the main cotton area will be reduced to a minimum.

The Department considers it inadvisable to import larger quantities of seed of each variety, not only on account of the danger of introduction of injurious pests and diseases, but also of the "new place effect" which varieties of cotton often exhibit when introduced into countries with different climatic and soil conditions. The experiences with several of the varieties which the Department has introduced have indicated that very misleading results may be obtained in the tests conducted during the first few seasons a variety is tried out. Experiences in other cotton-growing countries have also been along similar lines. It is believed, therefore, it is better to at least partially acclimatise a variety before conducting any large scale of tests.

Durango Results.

The growers may rest assured, however, that the Department is going to try and overcome the difficulties which appear to have arisen in connection with growing the Durango variety in some areas. I would point out, however, that in some districts this variety has given excellent results over a series of years, and during my recent trip growers assured me they were well satisfied with the returns they had obtained from it. It can be seen, therefore, that it may be necessary to carry out a large number of carefully conducted experiments over a series of years before any finality may be reached as to which variety or varieties are best suited to Queensland conditions. This will require the hearty co-operation of the growers in the many districts in assisting the departmental officials in carrying out these most important tests.

BANANA EXPERIMENT STATION, KIN KIN.

ACTING MANAGER'S REPORT.

The Director of Fruit Culture, Mr. George Williams, has received the subjoined report from Mr. H. Collard, Acting Manager of the Kin Kin Banana Experiment Station.

Plot No. 1.

Variety, Gros Michel; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda super, and muriate of potash; cost of fertiliser per stool, 7d.

Desuckering to produce in separate rows, 1-2 and 3 followers. Baiting with cut portion of pseudostem dusted with Paris green and flour 1-6, also with borax and flour 1-5. This method of control for beetle borer was undertaken immediately after my arrival in October, 1929, and continued up to January last.

Regarding the present condition of these plants, the majority of which are carrying bunches, the growth generally is poor, rather short in stature, and lacking in girth. The plants attain a height of 6 to 8 feet, then produce bunches carrying 8 to 11 hands of bananas, 6 to 7 inches in length, 7 inches being the average length. The suckers for subsequent fruiting are of a comparatively poor type, attributable to unfavourable conditions, notably imperfect drainage in places, excessive shale, and absence of soil in other parts combined with leaching of essential plant foods.

Leaf spot and premature leaf decay are particularly conspicuous throughout this plot.

Plot No. 2.

Variety, Sugar; when planted, February, 1929; distance apart, 15 x 15; fertilisers applied, No. 5 (3 lb.), super, and muriate of potash 1-1; cost of fertiliser per stool, 6d.

When regard is paid to cost of fertiliser per stool and the ingredients applied, the general appearance of both parent plants and followers does not come up to expectation. Bunches of from 5 to 8 hands are carrying fruit rather below the standard quality for this variety.

During November, 1929, Mauritius Beans were planted in double rows between alternate rows of stools, for the purpose of determining whether a detrimental or beneficial effect might be observed in so far as the general appearance of plants are concerned when growing a crop of legumes in close proximity over a lengthy period.

Evidence so far obtained tends to favour rather than discourage this procedure, for the vigour of both parent plants and suckers up to the present stage are by no means impaired but rather the contrary; furthermore, from an economical viewpoint, a considerable saving is effected in chipping, and considerably less damage caused to surface roots, whilst the soil between the rows maintains a more even moisture and helps to retain the surface soil brought down from the higher areas during erosion. Fertilisers were again applied during the past month in varying quantities per stool of incomplete and complete fertilisers.

Plot No. 3.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, No. 5 (3 lb.), Nauru (2 lb.); cost of fertilisers per stool, 5¼d.

This plot has been set apart for Leaf Spot experiments, and also for beetle borer control. The work in connection with the former has been carried out under instructions from Mr. J. H. Simmonds, Plant Pathologist.

The vacancies occurring by the removal of these plants have been at various times replaced by carefully selected suckers and butts, these being treated with coal tar and water boiled together for twenty minutes, strength 1-3.

The plants after immersion in this preparation were planted and three months later thirty-four plants upon examination gave the following results, twenty-one completely rotten with no indication of having been attacked by the borer.

One plant having two adult beetles (alive) and two plants each having one adult beetle (alive) on the corms, but in no instance was actual tunnelling observed. Tar treatment has proved fatal to the majority of suckers and butts set out in shaley gullies, but when planted in a reasonable depth of soil, although undoubtedly retarding growth, eventually assumes normal development apparently unimpaired by the treatment.

Leaf spot and premature leaf decay, particularly towards the northern and western extremities of this plot, is much in evidence, which condition is obviously accentuated—in the former case by excessive clay.

The plants throughout this plot show a marked variation both in regard to vigour and size of bunches, the latter varying from 7 to 9 hands with fruit from 5½ inches to 6½ inches long.

A definite black moistened apex apparently originating at the flower tip is frequently observed and affecting a fairly large proportion of bananas, the dark moistened area extending and encircling the skin of the fruit. This affected area exudes small gummy spherical particles. I intend bringing these particular bananas under the notice of Mr. Simmonds on his next visit to this station.

Plot No. 4.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertiliser applied, N. soda (1 lb.), amm. sulph. (2 lb.), cost of fertiliser per stool, 5¾d.

This plot is situated on the eastern boundary and having better soil, lesser amount of shale, and good drainage. The plants possess a good girth of pseudo stem, but lacking in height; the followers are making very fair growth. Bunches vary from 8 to 10 hands of fair quality fruit. The effect of nitrogen in combination with more favourable soil conditions was very marked in both leaf development and colour during December and January.

Leaf spot although present is of lesser extent than observed in Plot 3.

Plot No. 5.

Variety, Lady Finger; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda (1 lb.), super. (1 lb.), muriate of potash (1 lb.); cost of fertiliser per stool, 6¾d.

These plants have made very fair growth, attaining a height of 10 feet before fruiting, the bunches are from fair to good both in size and quantity, suckers profusely and of a very fair type.

Plot No. 6.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10.

This area has received applications of fertilisers, details as to the various ingredients, quantities, and costs per stool are as follows:—

Rows.	Per Stools.
1 and 2—Unfertilised.	
3 and 4—Nitrate soda (3 lb.)	5¼d.
5—Control.	
6 and 7—Superphosphate (3 lb.)	2¼d.
8—Control.	
9 and 10—Nauru phosphate (3 lb.)	2¼d.
11—Control.	
12 and 13—Amm. sulph. (3 lb.)	6d.
14—Control.	
15 and 16—Muriate of potash (3 lb.)	4½d.
17—Control.	
18 and 19—Bonedust (3 lb.)	3d.
20—Control.	
21 and 22—Nauru V amm. sulph (3 lb.)	8¼d.
23—Control.	
24 and 25—Nitrate of soda and bonedust (3 lb.)	8¼d.
26—Control.	
27 and 28—Superphosphate and muriate potash (3 lb.)	6¾d.
29—Control.	
30 and 31—Muriate of potash and bonedust (3 lb.) 1-1 ..	3¾d.
32—Control.	
33 and 34—Muriate of potash and bonedust (3 lb.) 1-4 ..	4½d.

The rows set apart for fertilising run north and south following a very steep incline with the first six rows of plants occupying land falling towards a stony gully on the western side, whilst on the eastern side of the plot is also a shaley gully or watercourse running from the south-east towards north-north-east, passing almost through the centre of the plot.

Such comprehensive manurial tests as conducted on this site possessing as it does much irregular conditions and qualities of soil, unfavourable gradient and formation when percolation and erosion takes place, it is obvious that any attempt to obtain authenic or reliable information is utterly futile. This fact is further enhanced when particular attention is paid to the untreated rows, where frequently the general appearance of the plants and also the bunches and quality of the fruit

likewise the development and type of suckers produced are observed to be equal and occasionally superior to those growing in rows which have received manurial treatment.

Generally speaking, the plants growing on the eastern and western portion irrespective of treatment are regarded as very fair, whilst those in poorer land and shaley gullies are much inferior. Bunches vary from 7 to 9 hands with bananas from 5 to 7 inches in length. Dusting experiments with copper carbonates for control of leaf spot are in operation throughout this plot under instructions from Mr. J. H. Simmonds.

Plot No. 7.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, untreated.

This plot although untreated will compare favourably with those on the western side of Plot 6, but, however, slightly inferior on the centre area and upper portion where the soil verges into ironbark land.

Plot No. 8.

Variety, cavendish; when planted, January, 1929; distance apart, 6 x 6; fertilisers applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

This plot is a network of plants, in several instances plants have produced a bunch of bananas when attaining a height of 4 to 5 feet. The plants generally have a comparatively short pseudo stem, although of fairly reasonable girth. The number of plants at present bearing bunches are few, the bananas in some instances compare favourably with those of 10 by 10 spacing, whilst in other instances the actual fruits have a more shrunken or pinched appearance.

Plot No. 9.

Variety, Cavendish, distance apart, 6 x 6; when planted January, 1929; fertilisers applied, untreated.

Comparable with Plot 8; no appreciable difference in quality of fruit and general appearance of plants apparent.

Plot No. 10.

Variety, Cavendish; when planted, January, 1929; distance apart, 9 x 9; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

A slight improvement is observed in growth of plant and girth of pseudo stem, but very few bunches are produced. Those, however, which are showing appear to be slightly better than those on Plot 9.

Plot No. 11.

Variety, Cavendish; when planted, January, 1929; distance apart, 12 x 12; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Owing to a large number of plants failing to grow and replanting having to be undertaken the plants on this plot are not of uniform height. The original plants, however, show a marked improvement both in height and girth and leaf development. Up to the present only a few bunches have appeared, but these are of very fair quality and length.

Plot No. 12.

Variety, Cavendish; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Leaf development, height, and girth of plant show marked improvement over 6 by 6 planting, and are regarded as equal in all respects to the better type of suckers and bunches of those growing on Plot 11, but it is observed that bunches are somewhat slow in development, carrying hands of from 7 to 10 with open fingers of bananas 6½ to 7 inches in length.

PURE MILK.

NECESSARY PRECAUTIONS ON THE FARM.

For pure milk, stated the Metropolitan Dairy Inspector at a recent New South Wales Agricultural Bureau conference, he believed there was every prospect of an increased consumption, but it was necessary to remember what the term involved.

There were times, said the speaker (as reported in Agricultural and Pastoral Notes, issued by the N.S.W. Dept. of Agriculture), when one was forced to the conclusion that the term ''pure milk'' was in danger of entirely losing its significance, a state of affairs brought about by its free and unrestricted use by every individual engaged in milk distribution. The term could be seen, in the city at any rate, on signboards, billheads, advertisements, and all sorts of milk vehicles, and by its common usage the public had become somewhat indifferent to the value of its meaning. Pure milk was the fresh, unadulterated, and uncontaminated lacteal product of the healthy cow, and it was or should be the ideal of those whose job it was to produce it and those whose duty it was to supervise it and handle it that it should reach the public true to label and not anything less.

A Common Source of Contamination.

Clean and healthy cattle were essential to a pure milk supply, and in this regard the farmer's attention might first be centred upon a very common source of contamination of milk—the soiled body of the cow. Contamination, sometimes of the worst form because it might be pathogenic, was quite possible and had come under notice as a result of the unclean external of the cow. A dairyman needed to be constantly on the alert and to practise every precautionary measure against this form of contamination. Local and climatic conditions naturally played a big part in body soiling; the dairyman's responsibility was always present, but the vagaries of the weather were the governing factors in his methods of combat and control. Dust during continued dry weather was of far-reaching importance, but none the less important was mud during the wet. The position of the udder lent itself to easy external contamination. A herd of cows with well-developed udders was the aim of every progressive dairyman, but the bigger the udder the greater the external surface to deal with. A good, big, well-packed udder was worth the extra trouble, however, and there was no denying the fact that cows were partial to grooming with a soft brush or cloth.

Body soiling occurred in different ways. Amongst the most common was that which occurred on the night camp. It was the practice on many dairies where early morning milking was the rule to keep the cows handy in a comparatively small paddock overnight so that a round-up might be dispensed with in the morning. In cases where hand feeding in the bails was resorted to the cows of their own volition were never far away, and in either case as a result of constant use the ground or the greater portion of it became denuded of grass, and as a result the cows carried in a fair measure of dust or mud, as the case might be. Again, cows that were well fed spent a considerable amount of time in a recumbent position, and might select about the worst place they could for their siesta. Soiling from these causes was thus comparatively easy, and when it was borne in mind that many organisms, some of them disease-bearing, had their habitation in the soil, the necessity for care was evident.

Some Worth-while Measures.

Lack of appreciation of this necessity might indeed prove serious. An excellent precautionary measure was the clipping of the cow's udders. The resultant short hair offered less opportunity for dust or dry particles of earth to adhere, and the udders were easier to clean. Wiping of the udder and contiguous underparts with a damp cloth prior to milking was a simple thing and should always be done. Should mud be adhering, such as might happen in wet weather, the udder must be washed, but must be sufficiently dried and not left sloppy.

Contamination also occurred during wet weather as a result of the drip off the cow's body. Ten minutes under a roof before milking began would give them a chance to drain off, but failing that a scrape down on the milking side minimised the trouble.

Contamination also might occur as a result of scouring, and in this respect the ''longtail'' was something to be avoided; tails should be sufficiently shortened up. Body soiling after calving, particularly if things did not go right, also often occurred, and the tails and hind parts demanded attention. Contamination from these two last-mentioned causes was very objectionable, and such milk might rapidly develop into a menace, particularly to those of tender years.

WANTED A BETTER CLASS DAIRY COW.

RESULTS of the work of the studmasters of Australia supply ample evidence that the real dairy cow, the cow that produces butter fat at the least cost and returns the greatest profit, is the production of intelligent breeding, feeding, and management. If a cow does not inherit the function of producing a large quantity of butter fat, no method of feeding and management, however expert, can materially increase the yield. Pedigrees of themselves have little influence on the yield of milk and butter that a cow gives, production capacity being an hereditary characteristic. The high-class dairy cow is born with a capacity of giving a large flow of rich milk over a normal lactation period.

Systematic Herd Testing.

The successful breeder becomes familiar with the points and general characteristics of the breed of his choice, and he learns that there is a wide range of variation in production capacity among animals of the one breed. He finds it necessary to study individual animals and by systematic testing determine the production of each cow in his herd. Such information is the basis of assessing production costs—the chief essential in placing this business on a sound financial foundation. The work of recording shows that some dairy farmers obtain as much from one cow in cash as from three other cows fed and cared for in a similar manner. Herd recording enables the dairyman to remove the present burden of a ''boarder,'' whose production is below a profitable basis, and proves the economical advantage of providing suitable fodder, the value of breeding to high class dairy sires, and the real worth of the young stock from recorded dams.

The Choice of a Sire.

Herd recording assists in the choice of a sire which is an important part of a breeder's enterprise, for the success or otherwise of a stud breeder depends to a great extent on the skilful selection of a sire and careful mating. The influence of a sire in a stud or herd cannot be overestimated, for every stud or herd of note has gained its position through the use of high-class prepotent sires. The influence of a number of famous dairy sires is much in evidence to-day through the pre-eminence of studs headed by worthy successors to famous dairy sires of the past whose good influence, through generations of careful breeding, established the law of heredity. In the breeding of dairy cattle it is recognised that production qualities are perpetuated by the use of sires the progeny of dams whose achievements have placed them in a premier position as producers of butter fat.

The all important matter of selecting the sire taxes the skill and judgment of breeders of domestic live stock. Some stud breeders possessed of insight and keen judgment acquired as students of pedigree, conformation, and performance are able to select readily the right class of sire from which to breed. The best of judges may, however, select a sire that does not beget animals of merit. In selecting a sire careful consideration must be given to type and characteristics of the animals from which he sprung. When in search of a sire the experienced breeder is influenced by the quality of the herd that appeals to him and which has produced strong sire lines. In estimating a sire's influence in a herd, attention must be given to the production traits of the female lines in his pedigree, extending over a number of generations. The study of the blood lines of the sire combined with a knowledge of the lines of blood of the females to which he is to be bred, will enable a breeder to select a sire to ensure systematic line breeding which has proved so highly beneficial in establishing many first-class studs. It is through a sire bred on production lines that the desired characteristics are transmitted to his progeny, and herds noted for high production are established. Many of the most successful dairy sires were not up to show ring form, but they all came from good producing ancestry of pure blood lines. The sire that all studmasters and dairy farmers should place at the head of their herds is one possessing a combination of high breeding and production merit. The Pure Breeds Association have on hand an official register of sires possessing such qualifications.

SOME OFFICIAL TESTS.

The dairyman who knows the value of each individual cow in his herd is right on top of his job. Recent official testing results supplied by officers of the Dairy Branch reveal that the cows listed as follows have qualified for entry in the Advanced Register.

SOME OFFICIAL TESTS.

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
			Jersey.					
		Days.		Lb.	Lb.			
Lindley's Hope 2nd	4	264	Senior, 2 year old	4613	232·296	Lindley's Billy Hughes	Lindley Hope	H. Bellert, Gurgeena
Lindley's Handsome 2nd	2	273	Senior, 2 year old	4551·25	225·806	Lindley's Billy Hughes	Lindley Handsome	H. Bellert, Gurgeena
Hamstead Beryl 2nd	1 and 7	273	Junior, 2 year old	5868·625	272·862	Trecarne Cardinal	Beryl 12th of Condamine	J. R. Roberts, Toowoomba
Hamstead Gold Spangle	2 and 7	273	Junior, 2 year old	5307·5	243·781	Trecarne Cardinal	Golden Beauty of Condamine	J. R. Roberts, Toowoomba
Trinity Georgette	95	273	Mature	7732	390·845	Trinity Defiance	Trinity Coral	J. Sinnamon, Goodna
Trinity Orchid	180	273	Senior 2 year old	8196	398·674	Ginger Duke	Trinity Sunset	J. Sinnamon, Goodna
Trinity Lavender	186	273	Junior, 2 year old	7762	318·506	Ginger Duke	Brunette of Kardinia	J. Sinnamon, Goodna
Trinity Columbine	157	273	Junior, 2 year old	7551	433·703	Trinity Governor	Trinity Coral	J. Sinnamon, Goodna
Trinity Meteor	199	273	Junior, 2 year old	5697	302·562	Trinity Governor	Trinity Mystery	J Sinnamon, Goodna
Trinity Gentle Lady	119	273	Senior, 4 year old	8324·5	377·754	Lord Ettrey of Banyule	Trinity Jewel	J. Sinnamon, Goodna
Trinity Sultan's Lass	H.B. 2453	273	Mature	8632	426·786	Trinity Mark of Honour	Sultan 4th of Oaklands	J. Sinnamon, Goodna
Trinity Daffodil	56	273	Mature	8246·75	432·483	Ginger Duke	Beaulieu Netta (imp.)	J. Sinnamon, Goodna
Trinity Keepsake	195	273	Junior, 2 year old	6228	325·362	Ginger Duke	Trinity Sultane	J. Sinnamon, Goodna
Speck 2nd of Hazelhurst	33	273	Junior, 2 year old	6855·25	411·648	Hadleigh Golden Lad	Hazelhurst Milkmaid Speck	C. Austin, Boonah
Shamrock of Glenore	62	273	Senior, 2 year old	5089·3	257·281	Safety's Hero of Glenore	Shamrock Farm Buttercup	A. F. Birt, Gundiah
College Prism	16	273	Junior, 2 year old	4586·125	217·59	Burnside Defender	College Peate	Agric. College, Gatton
Lindley Lady Prim	5	365	Mature	11092·5	613·444	Bright Star's Prince	Miss Prim	A. H. Bulow, Mulgeldie
Lindley Bright Star	6	273	Mature	7838·75	408·543	Bright Star's Prince	Talgai Creamery	A. H. Bulow, Mulgeldie
Starbright of Hazeldean	4	273	Junior, 2 year old	4665·25	285·146	Lindley's Bright Lad	Lindley Bright Star	A. H. Bulow, Mulgeldie
Lindley Creamery	12	273	Mature	7237·5	384·632	Lindley Waimate	Creamery	A. H. Bulow, Mulgeldie
Belle of Hamilton	03	273	Mature	7257·25	370·483	Palatine King	Countess of Hamilton	H. J. Wilton, Raceview
Cherry May of Pine Hill	7	273	Junior, 2 year old	4405·25	217·855	Fazelea Peer	Cherry May of Rosedale	A. F. Birt, Gundiah
Baby 3rd of Glenore	59	273	Senior, 2 year old	5376·3	257·812	Safety's Hero of Glenore	Baby of Glenore	A. F. Birt, Gundiah
Storm Queen of Peachester	55	273	Senior, 4 year old	6915·9	376·028	Glengarriffe Nobles Warrior	Maid of the Mist	A. Rough, Peachester
Pineview Buttercup	6	273	Senior, 3 year old	7913	481·563	Carnation Lad	Pineview Princess	J. Hunter and Sons, Borallon

SOME OFFICIAL TESTS—*continued.*

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
						Illawarra Milking Shorthorn.		
		Days.		Lb.	Lb.			
Lovely of Alfa Vale ..	21	273	Senior, 2 year old	8228·875	336·909	Greyleigh of Greyleigh ..	Nellie 4th of Sunnyview ..	W. H. Thompson, Nanango
Nellie 3rd of Sunnyview	43	273	Mature ..	11255·5	452·069	Diamond of Greyleigh ..	Nellie of Bangalow ..	W. H. Thompson, Nanango
Handsome 3rd of Aurora	25	273	Mature ..	10637·75	484·946	Florrie 2nd's Boy of Blacklands	Handsome 2nd of Hillcrest	D. Spoor and Sons, Mundubbera
Emma 11th of Springdale	269	273	Senior, 2 year old	8388·5	323·759	Emperor of Springdale ..	Emma 10th of Springdale ..	D. Spoor and Sons, Mundubbera
Favourite of Normanby ..	17	273	Mature ..	10212	473·051	Envoy of Normanby ..	Fancy of Normanby ..	H. Dickfos, Coleyville
Amy of Greyleigh ..	26	273	Senior, 3 year old	9383·5	381·310	Brightlight of Darbalara ..	Amy 4th of Fairfield ..	F. E. Birt, Sexton
Cherry of Lynfield ..	161	273	Senior, 2 year old	8867·35	370·86	Royal Monarch of Blacklands	Damsel of Lynfield ..	F. E. Birt, Sexton
Hilda of Mount Blow ..	53	273	Senior, 2 year old	7283·625	270·835	Brilliant of Greyleigh ..	Joyce of Mount Blow ..	Mrs. J. Handley, Murphy's Creek
Violet of Beechwood ..	89	273	Mature ..	9109·8	353·18	Bonnie's Fairfield of Beechwood	Mermaid of Beechwood ..	F. W. Woolley, Moregatta
Pettie 3rd of Springdale ..	01	210	Mature ..	9024	369·442	Fussy Knight 2nd ..	Petty 2nd	T. G. O'Meara, Humphrey
Sweetheart of Royston ..	1	273	Mature ..	11696	467·168	Artist of Wunulla	Pettie 3rd of Springdale ..	T. G. O'Meara, Humphrey
Princess 7th of Fairlie ..	137	273	Senior, 2 year old	7833	321·222	Dividend of Rosenthal ..	Princess 3rd of Fairlie ..	C. B. Mitchell, Warwick
Bella 12th of Kilbirnie ..	163	273	Junior, 3 year old	9609	391·861	..	..	Macfarlane Bros., Radford
Buttercup 6th of Burradale	117	273	Mature ..	9730·25	371·561	Kitchener of Burradale ..	Buttercup of Burradale ..	Agric. College, Gatton
Belle of Royston	09	273	Mature ..	9366	382·234	Sherry 2nd of White Park	Bud of Royston	T. G. O'Meara, Humphrey
Mayflower 5th of Rosenthal	317	273	Senior, 4 year old	8375	311·743	Hopeful of Rosenthal ..	Mayflower 3rd of Rosenthal	S. Mitchell, Warwick
Lassie 15th of The Cedars	31	273	Senior, 2 year old	6974·5	269·187	Red Knight of Greyleigh ..	Lassie 5th of The Cedars ..	J. L. Lydnon, Worongary
Polly 7th of Springdale ..	299	273	Junior, 2 year old	8846·25	341·532	Lovely's Commodore of Burradale	Polly 5th of Springdale ..	Hickey and Sons, Wilston
Duchess of Murray's Bridge	20	273	Junior, 2 year old	8286·5	305·041	Valiant of Greyleigh ..	Duchess 4th of Brooklyn Terrace	Hemming Bros., Warwick
Stately of Roselea ..	94	273	Senior, 2 year old	6962·25	275·329	Florrie's Victory of Blacklands	Nutley of Blacklands ..	J. F. Reinke, Mundubbera
Picture 6th of Raleigh ..	9	273	Junior, 4 year old	9804·673	405·526	Democrat of Raleigh ..	Picture 2nd of Raleigh ..	A. J. Caswell, Wangalpong
Rosie 4th of Greyleigh ..	152	273	Mature ..	12957·375	479·211	Joffre of Greyleigh ..	Rosie 3rd of Greyleigh ..	A. J. Caswell, Wangalpong
						Friesian.		
Hermoine of St. Gwithian	6	273	Mature ..	13249·5	432·624	Pabst King Pontiac Lad ..	Miss Hook	Hickey and Sons, Wilston
Pontiac College Princess ..	D.A. 1	273	Mature ..	13564·5	479·88	Pabst Pontiac Bene Star ..	College Prima Donna ..	Hickey and Sons, Wilston

SHEEP FARMING.

By J. L. HODGE, Instructor, Sheep and Wool.

THE Department of Agriculture and Stock is willing at all times to send an officer to give advice to the small selector on all matters appertaining to the improvement of the block, ring-barking, water, fencing, the erection of permanent improvements, and a lot of other points which, correctly given and faithfully followed, means a great saving in money to the selector, and possibly the difference between success and failure.

Make Haste Slowly.

Too many young men start operations full of enthusiasm, but lacking in judgment. Make haste slowly is sound advice. In the matter of fencing, which undertaken by an inexperienced man can run away with a lot of money without giving the return it should, the selector would be well advised to first of all complete the horse paddock, after picking the best possible position for it, having in mind the enclosure of water without interfering with the supply for the sheep paddocks outside.

Should the natural lay of the land enable one to place the horse paddock somewhere near the centre of the property, the selector is fortunate, for not only does the horse paddock fencing count as part of other subdivisions, but much time is also saved in the course of the year by having the homestead and horse paddock centrally situated. My reason for advising the selector to complete the horse paddock before undertaking any other work is based on years of experience. Too often horse hunting goes on for half a day, which could be so profitably spent otherwise.

If the selector is unmarried, the homestead can be considered later.

Attention should now be given to the boundary. More than likely there are only two sides to fence. This should be completed as soon as possible. Many a selector has had a lift in a financial way by being in a position to take stock on agistment.

Finance.

Having arrived at this point in the development of the holding, the selector should take careful stock of his financial resources. With a horse paddock and boundary completed, one is now in a position to carry some stock. It should now be the object of the owner to make the selection pay for further improvements. Advice with regard to stocking depends to a great extent upon the financial resources of the individual, but for the purposes of this paper we will take it that the selector has his way to make and a rough row to hoe. As before mentioned agistment sheep may be secured. In this case conserve finances with the object at the end of the agistment of being in a position to purchase a small line of sheep. In this connection it is as well to mention here that the Agricultural Bank will advance up to £1,200 for this purpose at 5 per cent. interest to approved applicants, and very liberal terms in the matter of repayments.

Although against a mortgage on general grounds the writer is of the opinion that the selector should at this period of his career on the land make use of the facilities offered.

Stocking.

Then comes the all-important question—"What sheep to purchase?"

If the country is heavily timbered, probably no ring-barking has yet been done, and the land in its virgin state may not be first class. Under these circumstances, I would advise the purchase of a line (to suit the purse) of fattening wethers, the object again being to make the sheep pay for further improvements. Shear these once, and endeavour to fatten with about a four to six months wool.

Where the land selected is improved sheep country I suggest the purchase of a line of ewes for a start, say four to six years old, as the price asked is likely to suit the ability of the selector to pay. In this case make every endeavour to keep the ewe lambs as the basis of a future flock. The greatest care should be taken in purchasing a type of sheep suited to the country and other local conditions. Herein may possibly be the difference between success and failure. If inexperienced, let the selector seek the advice of some old hand in the district, or the services of an officer of the Department of Agriculture and Stock.

Great importance attaches to the sheep to be purchased and, in the case of ewes, the selection of the right type of ram to mate with them.

Let it always be remembered that, apart from the sheep an owner would like to breed, he must, to achieve the greatest success, go for a type to suit his country, rainfall, and local conditions generally.

Quality is important, but the breeder should never lose sight of the fact that constitution is of the major importance. In districts like the west of Queensland, where periodical droughts may be looked for, it is of the utmost importance that the type of sheep bred should be able to stand up to hardships, travel to water, and generally forage for itself. The selector's object should always be to have good sheep. It costs just as much to feed a bad sheep as a good one, and one good sheep, properly nourished and looked after will return as much as two ill-bred and badly nourished animals.

I would always recommend the selector to go after the strong, medium big framed bold type of merino somewhere about a 60's quality. Having found a type suitable to the country stick to same. A great deal of harm is done to flocks by constantly chopping and changing in the matter of rams. Breed only, of course, from purebred stock, and the longer the pedigree of the animals and the foundation of the stud from which they come the better.

The rams should be slightly stronger in quality than the ewes or the progeny expected. Wool bred in the West has a tendency to fine up with the age of the sheep, and this should be remembered when founding a flock. Having established a flock it should be the aim of the selector to keep them good, and this, apart from general maangement, can be best done by judicious culling.

Before mating the ewes with the rams, go through the former carefully, and reject anything of the type not required, and reject also for any other reason such as malformation, size, want of constitution, &c.

Management.

Management will be learned by careful observation of the methods of neighbours long and successfully established in the district.

Change the sheep frequently from pasture to pasture. Even if, sometimes, a paddock appears to have less feed, the flock will improve.

Watch the condition of the flock keenly, and if a falling off in condition is observed find out the cause quickly.

In these days stomach worms should be watched for. The humped back, white skin, and sickly white in the eye when examined, an inclination to lag behind the rest of the flock, are all symptoms of this disease. Immediate steps should be taken to combat the infestation, and in this connection I would urge the grazier to get in touch with the Department of Agriculture and Stock. The best known drenches and their means of preparation and application to the sheep will be furnished.

Blowfly trouble should be early observed if there, and the treatment at once applied. In the case of these and other diseases or parasites, the Department is always willing to help, and full use should be made of the advice offered.

The Homestead.

If finances permit, consideration may now be given to the homestead. If the property merits the expenditure and if funds permit it is always well to erect a decent house. Apart from the living comforts, a decent homestead always has value in the eyes of a purchaser.

Woolshed and Yards.

Yards and woolsheds are a necessity, and these, too, should be up to the mark. In fact, with all improvements, it will be found economical in the end to make them as good as the property merits. Avoid over-improving. It must be remembered that the money outlay on improvements costs interest, and all should be of such a nature as to earn that interest and merit their existence.

Sheep Shearing.

For the first shearing it would pay the new man on the land to arrange with a neighbour. After getting the clip, combined with the proceeds of the sale of the wethers in the one case or the clip and the sale of the wether portion of the drop in the other case, the selector should be sufficiently strong financially to go on with other essential improvements.

Further Improvements.

Ring-barking where necessary is an economic necessity and should not be neglected. Some subdivision could now be gone on with, and here the greatest care should be exercised in making every panel of fence worth the money expended on it.

Water should have a guiding influence in the matter of sub-division fences.

It should, where possible, be the object of the selector to see that there is water in every paddock. If the country lends itself to the idea, subdivisions may run off the corners of the horse paddock, thus utilising the horse paddock fence in a double capacity. Gates, and good ones, should be erected at suitable places in the fences. It is advisable to make the gates good ones straight away. Too many beginners and others erect temporary (?) gates which stay for years and, apart from being an eyesore, are always a source of annoyance any time sheep have to be shifted.

SHEEP LICKS AND THEIR USES.

By J. L. HODGE, Instructor in Sheep and Wool.

The scientific need of a sheep lick should be determined by proved deficiencies in the soils, pastures, and the water to which sheep have access. This may be determined by analyses of all three.

The greatest proved deficiency in most Australian pastures is lack of phosphates. Therefore the basis of most licks should contain principally a material to make this good. The days when salt only was recommended in season and out of season are passed, and science has stepped in to indicate what ingredients should be supplied.

It does not follow that because a certain lick has proved beneficial to the flock in one district it is going to act in the same manner somewhere else. The main point to keep in view is the condition of the flock. Carefully note any falling off in condition, not attributable to seasonable conditions, and quickly find out the cause. In nearly all cases it will be found that there is some deficiency. This should be supplied with the lick.

When sheep are drinking from an artificial water supply such as bores and wells, analysis will show the amount of salt contained in the water. In prescribing a lick in the case where the water is proved sufficiently saline possibly no salt at all would be mentioned. On the other hand analysis may prove the entire absence of salt. Here the addition of the required amount may form the chief ingredient in the lick. Under drought conditions it is often beneficial to add a protein, such as linseed meal, to the lick.

Taken on broad lines and under adverse conditions, when a lick can be relied upon to do most good the ingredients should consist of phosphates, a protein, a laxative, and a tonic, with the addition of salt, the amount to be governed by the special conditions at the time obtaining.

The practice of feeding a lick to sheep in open troughs is not to be encouraged. Besides the risk of loss by rain, the flocks foul the mixture, making it eventually unfit for consumption.

A Lick Feeder.

The lick feeder recommended by the Department consists of a V-shaped trough with a hinged and covered top. There is an aperture at the bottom of the "V" which automatically releases the lick. A lick board sufficiently broad is attached to the stand about an inch and a-half below the opening and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Legislation these days makes it compulsory for the vendors to register their licks with the Department of Agriculture and Stock and to attach a label to each package setting out the contents. Many good proprietary licks are on offer, and the flockmaster proposing to purchase would be well advised to get the opinion of this Department.

During a good season the necessity for a lick decreases, and this is accounted for by the fact that the pastures themselves are supplying the sheep grazed on them with the necessary phosphates and food materials which are usually supplied in a lick when the season is adverse.

Beware of Over-Feeding on Salt.

Beware of over-feeding on salt in the case of ewes in lamb. I think it a good plan to take away most of the salt from a flock of ewes in lamb when half the period of gestation has passed.

The lick as prescribed and containing the salt may be fed to the dry portion of the flock with advantage should the salt be required, but the ewes in the case

stated should be deprived of the salt. The other ingredients may be given to advantage.

It should be the object of the flockowner to have his sheep consume from 2 to 3 oz. of a prescribed suitable lick per week. Ewes rearing lambs require more than dry sheep. Weaners and young sheep, too, could do with more than the dry portion of the flocks.

Rule-of-thumb Methods Out of Date.

It is not sufficient that sheep should be placed on grass irrespective of what that grass contains. It may be a case of starvation or malnutrition in the midst of plenty. It is what those grasses contain in the way of tissue, bone, and body builders which is so important.

The days are fast passing where rule-of-thumb methods may apply to the care and husbandry of sheep. Flocks lose condition, apart from drought, which is unavoidable, and too often the fact is either not noted or casually commented upon. There is a cause for this loss of condition, and it should be the care of every careful flockmaster to ascertain this cause. It will always be found that there is some deficiency, probably of those minerals which are so necessary for the maintenance of the health of the flocks. This deficiency should be detected and the ingredients required made available in the lick.

THE CARE OF THE CAR.

Every motorist will agree that the steering is the most important part of the motor car. A car travelling at 30 miles an hour covers approximately 15 yards a second, and it is very important, therefore, to know that the car is going just where the driver wishes it to. Peculiarly enough, the steering gear is a portion of the car that is most consistently neglected by the owner. Not only is it of vital importance to the safety of the car, but it has a remarkable bearing upon the comfort of driving. Many motorists wonder why an all-day drive is exhausting. However, when the number of steering operations made in a long drive is considered, the reason for physical exhaustion is obvious. There is among motorists much controversy as to what is the most satisfactory type of steering. Some prefer a large movement of the wheel, combined with lightness, whereas others prefer a small movement, even though the wheel be a little heavy to move.

The introduction of balloon tyres has increased greatly the difficulties of steering. The old high-pressure tyre made contact with the road on a very small area of the front wheel. However, the balloon tyre has a large flat area of rubber in contact with the road, and because of its good grip the road wheel is hard to twist, particularly when it is moving slowly.

Due to the introduction of balloon tyres there has been a tendency to reduce the turning circle of the car in the diameter of the minimum circle in which the car can turn. The balloon tyres caused an increase in the turning circle because designers found difficulty in making room for the bigger tyres, when the front wheels were twisted to their maximum deviation from straight ahead. A small turning circle is a great convenience when handling a large car on a narrow winding road. It is also of great use when attempting to park a car in congested streets.

The position of the steering wheel has a great bearing upon the comfort of the driver. The most comfortable wheel is one on which the driver naturally rests his hands. A wheel that is too far forward tires the driver, because he must always have his hands stretched out before him; on the other hand, a wheel that cramps the driver in his seat is insufferable.

The adjustable steering wheel makes for most comfort in driving, as the driver can move the wheel to suit his own requirements.

There are two obvious ways of reducing the effort required to operate the steering wheel. The first is to increase the leverage of the steering wheel over the road wheels and the other is to reduce the friction in the steering gear.

Although increasing the leverage reduces the force required to turn the wheel it carries with it the disadvantage that the steering wheel must be turned through a greater angle for any given movement of the road wheels. In the old days the usual thing was to have the steeding arranged so that one and a-half turns of the steering wheel would turn the front wheels from one lock to the other. Many modern steering wheels require two and a-half turns to do this. This increase in movement is a mixed blessing, as on occasions it is necessary to turn sharply when

only one hand is available for the wheel, and if the driver is not holding the wheel in a convenient position, he is liable to have to take a fresh grip before the turn is completed.

Reversible and irreversible steering are two terms often seen in motor car specifications, that are not always understood. The steering is said to be reversible when movement of the steering wheel will move the road wheels, and any tendency of the road wheels to deviate from the direction set will move the steering wheel. That is, the steering system works both ways. The steering is said to be irreversible when movement of the steering wheel will move the road wheels, but attempted movement of the road wheels will not move the steering wheel—that is, the steering system locks when an effort is made to work it in the reverse direction. An absolutely reversible steering gear would transmit all the sideways bumps received by the road wheels to the driver's hands, and so would make it necessary for the driver to hold the wheel very tightly if it were not to be jerked out of his hands. An absolutely irreversible steering gear, on the other hand, would transmit no road shocks at all through the steering wheel, but would also have no tendency whatever to be self-centring.

The tendency of the steering wheel to straighten up after a corner has been turned is known as self-centring. Some cars can be driven around a corner and then when the straight road is reached the wheel may be released, when it will "pay off" automatically until the car is moving straight ahead again. Such a steering system is truly self-centring, and many cars are fitted with such a steering system. However, in all cars the steering wheel can be returned to centre with much less effort than it takes to deviate the wheel from centre, so that all steering gears are partially self-centring. However, the more a steering tends to be irreversible the less will be the tendency towards self-centring. The designer must make the best possible compromise so that the driver receives only a little of the road shocks through the steering gear and at the same time does not have to exert any appreciable effort to straighten up after a corner has been turned. Some of the more expensive English car makers fit special hydraulic shock absorbers to prevent road shocks from being transmitted back to the driver.

One cause of very heavy steering is friction in the steering box and steering joints. Many motorists neglect the steering gear entirely when lubricating the car. This is probably due to the fact that the steering joints are usually inaccessible and seldom cause squeaks that will draw attention to their want of oil or grease. However, proper lubrication will prevent the steering from becoming unduly stiff and will also prevent excessive wear.

In almost all cars there is a ball joint at the end of the drag link. This ball joint in particular requires plenty of grease, if it is not to be worn quickly. The king pins should also be kept well greased, as the king pins carry a very heavy load which tends to squeeze the grease out very quickly.

The steering box invariably contains a piece of mechanism requiring plenty of lubrication, so that the careful driver should always see that this part is packed with grease or heavy oil. The various mechanisms contained in the steering box for converting the rotary motion of the steering column to the longitudinal motion of the drag link are very ingenious and will be discussed in another article.

In the interests of safety the steering gear should be checked frequently to see that all nuts are tight and all split pins in place. It should not be necessary to say that the steering wheel should never be turned while the car is at rest, for if this be done the steering gear will be strained unduly and possibly damaged.—Radiator in the "Farmer and Settler."

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ERADICATION OF DISEASE AMONG PIGS.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock, Brisbane.

The eradication of tuberculosis and other diseases in pigs is not difficult if certain very definite lines are followed to that end. The question arises: How does the pig become infected? It is undoubtedly manifest that there are several channels through which infection may be carried to the pig.

(1) Through transmission from parent to offspring.
(2) From milk and other dairy slops.
(3) The use of insanitary feeding troughs and general unclean condition of sties, and faulty methods of construction of sties so that it is a matter of impossibility to keep them clean and wholesome.

Hereditary Transmission.

Transmission from parent to offspring although possible is not a very constant source of infection, and may be dismissed with the observation that all things being equal there is in reality very little chance of infection from this source.

The Bucket.

Milk and other dairy slops are one of the chief sources of infection. Dairy cows all the world over suffer from tuberculosis. At least 2 per cent. of the cows of most herds are liable to spread infection through their milk supply, i.e., they have or are affected with tuberculosis of the udder, and unless this 2 per cent. at least are eliminated the chances of infection are very great. The elimination of this 2 per cent. is not a difficult matter, and it only requires the exercise of a certain amount of intelligence in order to do this successfully. Assuming that this 2 per cent. cannot for various reasons be cut out of the active list of the herd, the other method is to cook the skim milk before feeding it to the pigs. Raising a temperature of 155 deg. Fahr. for fifteen minutes will do all that is required, and not only the pigs but also calves will have the added advantage of being fed on milk which is not only very wholesome but absolutely free from disease. This is not a big undertaking and should be carried out purely as a routine practice, as it eliminates the germs of contagious mastitis, tuberculosis, and contagious abortion in one hit, and also a great many of the so-called diseases of young calves which are largely due to unclean methods of milking and treatment of milk after separation of the cream from the skim milk. The return as a result of immunity from disease will more than repay the added cost of the additional work necessary in order to insure immunity among the small immature stock on the farm.

Filth.

The use of insanitary feeding troughs and general unclean condition of sties and faulty methods of construction of sties make it a matter of impossibility to keep them clean and wholesome.

It is possible to obtain a culture of bovine tuberculosis and other bacilli from the cracks in the end of wooden feeding troughs. If these cracks or crevices are capable of holding such filth it is clearly an impossibility to breed healthy pigs.

If wooden troughs are an absolute necessity, then why not fill up the cracks and crevices with cement and clean them once every week with a strong solution of washing soda? There are certain woods which do not split and crack easily, such, for instance, as the mahogany which, although it will not stand in the ground, is used largely for piles in rivers where borers are prevalent. The erection of suitable pens with impervious concrete floors are an absolute necessity if disease is to be held in check.

The insanitary condition of pig pens. From their construction one is led to think that sanitation was not considered necessary and did not enter into the calculation of those who are responsible for such death traps. Slabbed floors raised off the ground through which excreta and products of decomposing vegetable and animal matter percolates on to the ground below and accumulating there for years is a common spectacle on most pig farms. The pig is securely enclosed in this sty, meticulous care being taken to make sure that all avenues of likely escape from such evil looking and filthy surroundings are completely cut off, with the result that he has to live his normal life surrounded on all sides by a cesspool of iniquitous fermenting filth, the gases from which escaping continuously not only make life a perfect nightmare but must of necessity breed disease, the result of which is only discovered when the returns from the factory disclose the fact. This specious form of cruelty should be discontinued if healthy pigs are to be bred, both for pleasure and for profit.

The Normal Pig.

Given healthy surroundings the pig is normally a hardy, thrifty animal and one that can be depended on easily to make the greatest profit out of the poorest food in comparison with other farm animals.

Breeding from healthy stock which are not inbred does help not only in early maturity but in keeping down disease. The pig is one of the few animals that will not stand inbreeding and whose constitution quickly resents any tricks in this direction. Breeding from immature stock, and this also includes promiscuous breeding, is a factor which cannot be too lightly regarded if success is to be assured in the breeding of pigs for profit.

Selection in Breeding.

The selection of breeding stock is not always attended to with the care that is necessary to guard against predisposition to disease. Knocked-kneed, swampy backed, boars and sows of similar conformation with the additional defect that they are down on their pins (i.e., weak fetlocks) are commonly seen among the breeding stock, with the result that these animals can easily be responsible for a great many of the ills attendant on immature young stock. "Like begets like" is one of the fundamental principles of breeding. This is a golden rule and is generally well known, but it is more often accepted and carried out in the breach than in the observance. So much depends also on the feeding of the parents not only after the pigs are born and still sucking their mother but before there is even a thought of breeding from her. The feeding of the boar is likewise as important, and neglect in this regard is responsible for so many failures—80 per cent. of the partial paralysis of pigs is bred into them by unsuitable mating of faulty parents and with such faults as are easily seen and could be quickly corrected by sterilisation of the unfit. If this was a difficult matter it might easily be overlooked, but as it is one of the everyday operations on the farm lack of care may easily account for a good deal of latent trouble, which manifests itself as time goes on, and the price paid for such neglect is altogether out of all proportion and makes all the difference between profit and loss. There is still another matter which is suggested for serious consideration, and that is the methods which may be adopted with the object of ridding the herd of the 2 per cent. cows which are in most herds and are infected with tuberculosis of the udder.

Getting Rid of the Two Per Centers.

Vaccination of all cows which have mammitis and the elimination of such cows which will not respond to treatment with vaccine, i.e., such cows as will not respond to treatment with vaccine even in as large doses as 20 cc. per day (the treatment starting with 5 cc. of vaccine as first dose) and at seven days' interval. If cows have tuberculosis of the udder there is no response, and if the cow survives the vaccine and if she is badly infected with tuberculosis of the udder she may die under such treatment. If she survives such treatment and still persists with active mastitis she is only fit for the local butcher if she is healthy in other parts of her body, but this is not likely. Therefore the first loss is the best, and she should be shot and burned or buried deeply in some dry soil on the border of the cultivation paddocks. All cows suffering from mastitis should be isolated and the milk buried until such time as the vaccine treatment is carried out, and this could be done by the owner with the assistance, in an advisory capacity, of the Dairy Inspector of the district.

This is suggested as a very good and practical method of ridding herds of the more saturated cases of tubercular disease.

BALANCED RATIONS FOR PIGS.

[*See Plate* 3.]

The six pigs shown in the illustration were litter mates and were "topped up" or prepared for market in a feeding demonstration conducted by the United States Department of Agriculture. The three at the top were fed only corn and a mineral mixture. The three at the bottom were given corn, skim milk, pasture, and a mineral mixture. Skim milk and pasture accounted for the difference. The photograph strikingly illustrates the values of a mixed diet in which the nutrients are balanced, providing not only for the development of fat and bone, but for blood, flesh, muscle, hair, and energy. Pigs fed balanced rations are profit makers, those fed corn alone are decidedly unprofitable and unthrifty. Study the feed and watch the profits grow.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

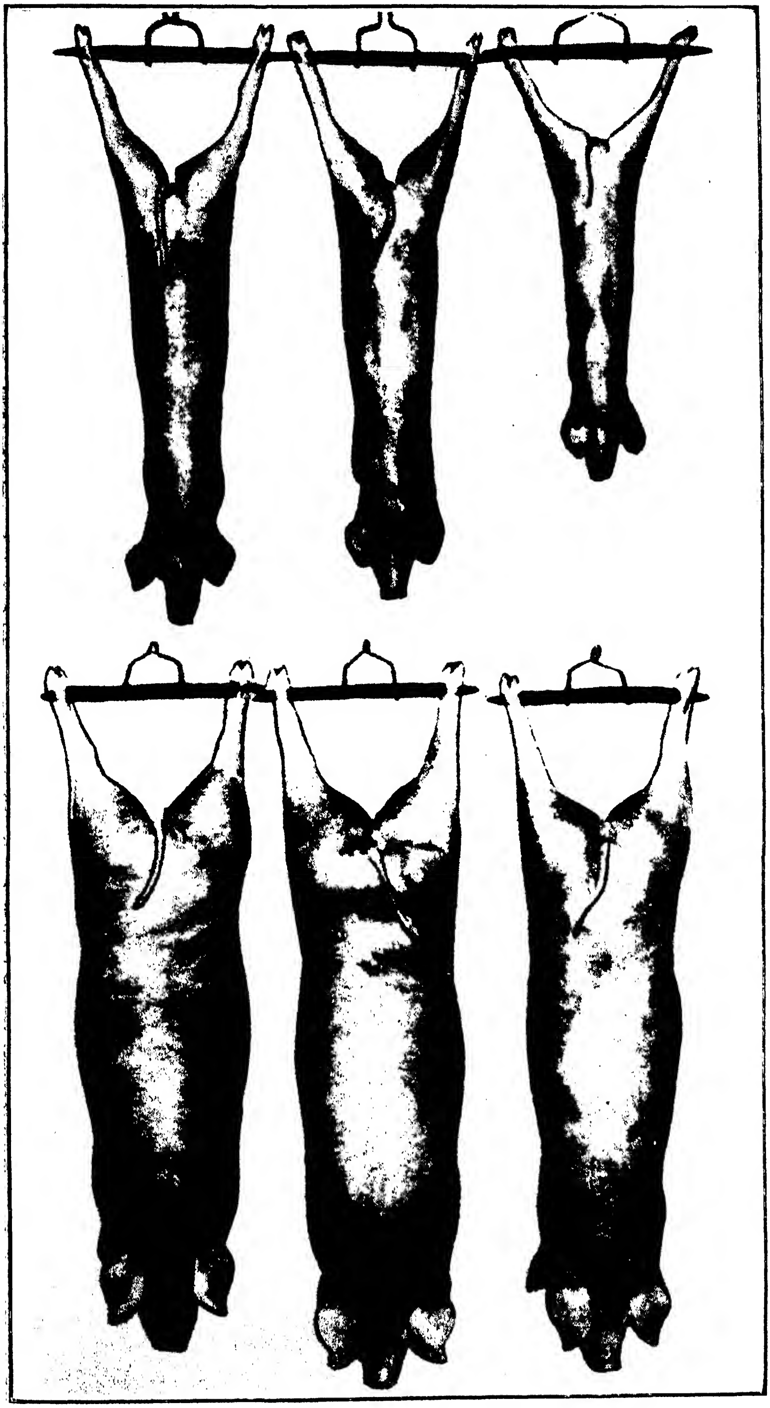


PLATE 3.

BALANCED RATIONS FOR PIGS—PROOF THAT IT PAYS TO FEED MORE THAN CORN TO THESE ANIMALS.

THE PIG FARM.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

The necessity of good accommodation for pigs has frequently been mentioned in educational propaganda in recent years, and we can now say that the majority of pig raisers in Queensland are well aware of the many advantages of having pigs kept under comfortable and hygienic conditions.

Queensland's climatic conditions offer many natural advantages to the stock raiser, the chief of which is the comparatively mild temperature throughout the year, which dispenses with the need for expensive housing to maintain stock in warm conditions during winter months. In these notes Mr. Downey offers many practical suggestions.

THE main objects to be borne in mind when planning a piggery are:—

(1) Sufficient enclosures to keep the stock under control;

(2) Comfortable housing for stock;

(3) Shade during the hottest weather;

(4) Water and food supplies;

(5) Convenience for working the piggery; also

(6) The cost must be carefully watched.

Contrary to the old idea that the piggery was necessarily an objectionable and unsightly section of the farm, this profit-making section can be made attractive and quite inoffensive with comparatively little expenditure, provided that the accommodation for the pigs is set out on correct lines.

The type of piggery to be constructed naturally is determined by the locality, the extent of the pig raising operations, and the nature of the food supply. Most pig raising ventures in Queensland can be classed under the following headings:—

(*a*) Butter-milk piggeries;

(*b*) Suburban piggeries;

(*c*) Slaughter-house piggeries;

(*d*) Agricultural and dairy farm piggeries, and there are a greater number of farmers engaged in pig raising under the last heading, than under the other three headings combined.

Pig accommodation is controlled to some extent by legislation, particularly as regards pigs being kept on slaughtering establishments, butchers' premises, and registered dairy farmers' premises; therefore it is advisable for persons about to construct piggeries or to alter the construction of piggeries on such premises to advise the local inspector, so that guidance may be given for construction in accordance with the Acts concerned. In some shires and municipalities, local by-laws are in operation regulating the building of piggeries, and therefore the Local Authorities should be consulted before building piggeries.

Remembering the many advantages of grazing pigs under what is usually termed the "Paddock System," every effort should be made, in planning a piggery, to provide ample grazing area for all pigs, either on natural pasture or on specially cultivated crops.

Butter-Milk Piggeries.

Under this heading are included some of the largest specialised piggeries in the State. The main source of food supply being the by-products of the dairy factory, this is usually conveyed from the factory to the farm by a pipe-line, although sometimes carted in tanks, and on these farms numbers of pigs ranging from 100 to 1,000 are usually found. These butter-milk piggeries are necessarily situated fairly convenient to the dairy factory, and this must be the chief point in consideration of a site for such a farm, even at the expense of utilising land that is not productive of good crops for pig foods.

However, with most butter-milk piggeries, situated handy to the butter factories, there is ample room for grazing paddocks for the pigs, even though the grazing may not be of the best quality.

On a piggery of this type, where a large number of pigs are to be kept, and it is necessary to economise in labour of feeding, the feeding arrangements must be conveniently situated, and where a large number of pigs are to be brought together for feeding, it is necessary to have concrete floors. Also if the pigs have to be housed together with a large number of animals on a small area of land, it will be necessary to have all their accommodation built on floors of an impervious and solid nature, preferably of concrete. However, in a case of this nature, it would be a distinct advantage to have adjoining paddocks where the pigs could be turned out for exercise.

Where pigs are obliged to remain confined in pens with concrete floors it will be necessary to provide a wooden sleeping platform where the pigs may lie and have no danger of rheumatism which often occurs when pigs are forced to lie continually on cold concrete. This wooden platform should cover a section of the concrete floor, sufficient for all the pigs to lie on, and may either be a movable section that could be removed for cleaning, or it could be made of 1½-in. grooved boards set in pitch and tarred over on top of the concrete.

Although the central pig house is usually to be seen on these buttermilk piggeries, there is no reason why the paddock system with individual houses should not be adopted so as to make fuller use of pastures for pigs.

Suburban Piggeries.

In close proximity to cities and large towns there are piggeries where the waste foods from hotels, boarding-houses, shops, and similar places, are put to good use as pig food. Similar piggeries are also run in conjunction with institutions such as mental hospitals and sanatoriums.

At such piggeries pigs are usually kept on an intensive system, and so well-constructed pens and sheds are built on a comparatively small area of ground. Again, this is only made necessary when land values are too high to permit of grazing paddocks.

Conveniences for cooking the food should be provided at these garbage piggeries and, of course, the peculiar system of feeding will also have some effect on the lay-out of the pens and feeding troughs.

Again, with the suburban piggery where pigs are confined to small pens, it is essential that they should have hard, impervious floors and a good drainage system; also it is necessary to have a plentiful water supply for cleansing purposes.

Slaughter-house Piggeries.

Slaughter-house piggeries are somewhat similar to buttermilk and suburban piggeries in that the pigs are usually kept on the intensive system, and so well constructed houses and pens and impervious floors and troughs are essential to good sanitation.

Boiling appliances are also necessary on the slaughter-house piggery, as all offal and meat fed to pigs must be thoroughly boiled.

In all of the three types of piggeries just dealt with, the fullest possible use should be made of direct sun rays as a disinfectant and deodoriser, also plenty of ventilation should be provided in the houses without allowing direct draughts on to the pigs.

Agricultural and Dairy Farm Piggeries.

This section includes the largest number of pig raisers, as practically every dairy farmer and every mixed farmer keeps at least a few pigs, while some make pig raising a most important section of the farm. The accommodation most suitable on such farms will depend upon the extent of the pig raising operations, but no matter how large or how small the venture should be, it is essential that sufficient accommodation of the correct kind should be provided.

It is most important in planning the piggery that a survey should be made of the extent to which the pig section of the farm may grow, and that the whole undertaking should be planned out on a definite system, because without system the piggery is a muddle. A farmer should reckon out the number of breeding sows he is likely to use and the accommodation he will need for those sows and the boar and their progeny, also an estimate should be made of the amount of grazing and cultivation land that will be required to grow feed for the number of pigs.

In choosing the site for the piggery, consideration should be given to aspect to provide shelter from prevailing winds and to make best use of early morning sun; for these reasons the northerly to easterly aspects will usually be found most suitable. If the paddocks can be made on a slope to give good surface drainage it will be a decided advantage, especially in wet seasons. Where separated milk from the dairy farm is to be used at the piggery an effort should be made to have the piggery situated down the slope below the separating room so that the separated milk may gravitate to the piggery in a line of open galvanised gutter piping, or even if it is necessary to carry or wheel the skim milk from the dairy it is easier to convey it down to the piggery than up to the piggery.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Although it means economy in fencing to have square paddocks, when pigs have to be fed in their own respective paddocks it would mean carrying food too far to each trough, and for this reason the piggery will be more convenient to work if long, narrow paddocks are provided. However, the paddocks should be large enough to allow of cultivation if necessary, also large gates or movable hurdles may be used at one end of the paddocks to allow entry of horses and implements.

Fig. 6 showing the layout of a piggery with sufficient paddock and shed accommodation for six sows and a boar and their progeny (up to six months of age), will be found a most convenient and suitable system for many dairy and agricultural farms. This system provides a paddock for dry brood sows, a small paddock for the boar, two paddocks for sows with litters until they are weaned, and four paddocks for growing pigs. These paddocks should provide ample room for running the pigs in small numbers, and one of the paddocks could occasionally be utilised for cultivation of crops to be grazed off by the pigs.

The system aimed at in this lay-out is to have the six sows divided into three lots of two, having two sows to farrow every two months; this can be fairly well regulated when the boar is kept in a separate pen from the sows, and it gives more control over the breeding and provides a regular supply of pigs throughout the year, particularly when crops are grown regularly to supplement the milk supply. Thus there is always ample grazing room for all pigs, and faster gains are made by the stock and losses from disease are minimised.

Although the sheds shown in this plan are double sheds placed over the dividing fences, other individual sheds, either fixtures or movable, on skids, could be used. Concrete feeding floors and troughs are shown, but although these are most satisfactory they may be replaced by well-made wooden troughs.

All the paddocks are shown leading out into a cultivation paddock at the bottom of the run, such a paddock cropped with lucerne to be either grazed off in sections by the pigs, using movable hurdles to control the feeding-off, or to be cut and thrown over to the pigs in their runs, provides a very valuable food supply for the pigs.

With all piggeries a convenient loading arrangement is a necessity, and so provision must be made for either a portable or a fixed race to run the pigs from the yard into the cart or lorry. The accompanying plan of the dairy farm piggery provides for a 16-ft. laneway leading to a loading race at one end, and with movable hurdles for moving pigs from one paddock to another or up to the loading race.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against outbreaks of disease.

Sheds.

There are numerous types of sheds suitable for different piggeries, and the type most suitable to a particular farm will have to be determined by the farmer, and conform with his local conditions. Certain requirements are general in all piggeries, firstly, the size. A shed suitable to use for a sow and litter or about ten growing pigs, or a boar, or about four brood sows would need to have a floor space of approximately 8 by 8 feet, but extra space in a shed is an advantage, also, with larger sheds, temporary partitions can be used to provide a number of separate sections. The height of pig houses should be sufficient to allow a man to move about inside without difficulty; nothing under 5 feet is satisfactory.

Considering Queensland's warm climate, ample provision should be made for ventilation, and yet there should be no cracks about the lower portions of the sheds to allow direct draughts to blow on to the pigs and cause chills.

It is advisable in planning pig houses to so arrange walls and doors as to have direct sun-rays into every part of the floor where practicable, and for this reason the open-fronted shed faced to the north-east can well be recommended. In some particularly wet districts, however, it may be necessary to have the front of the shed practically closed to prevent drifting rains from wetting the sleeping floor.

In selecting materials for building pig houses, the costs of various suitable materials will largely influence their choice, but in general corrugated galvanised iron roofs, wooden walls, and floors of concrete and wood or wood alone will be found most satisfactory.

Central Pig Houses.

These are found to be most suitable for buttermilk piggeries, slaughter-house piggeries, and suburban piggeries. Figs. 2, 3, 4, 5, and 9 illustrate this class of building which is of a more solid and permanent structure than small individual houses. In this type of pig house where large numbers of pigs are to be fed, impervious floors, preferably of concrete with wooden sleeping platforms, are essential. There should be a sanitary drainage system, and all drains should be shallow, smooth, and free from corners, and open to the sunlight, also the drainage must be delivered away to where it will not cause a nuisance.

In the large central pig houses where there is continual dampness around the feeding troughs, the use of concrete walls is very beneficial as they withstand the moisture better than do wooden walls.

Outdoor Double Sheds.

This type of shed, although different in many respects to the central type of house, has the idea of making one large shed do the work of two small sheds and thus saving one end wall, as it is only necessary to have a low partition between the two sections of the shed. This type of shed, as shown in figs. 12 and 13, is very useful under the paddock system; it is easily constructed and, where the paddocks are large, there is no necessity for special drains with this shed; this also applies to the smaller single sheds.

If it is necessary at any time to lock pigs in the open-fronted shed, a temporary hurdle can easily be erected along the front.

Pig houses with wooden floors should have the floors built from 6 to 12 in. off the ground in order to keep them dry and so that the ground under the floors may be kept sanitary.

Outdoor Single Sheds and Portable Sheds.

These are similar in design to the double sheds except that being complete for each paddock the sheds may be placed away from the dividing fences.

When the single shed is to be used in pig paddocks the best method of building same is to put it on runners, that will serve a double purpose of keeping the floor

boards up off the ground and also the runners can be used as skids; thus the shed is portable, and could be hauled about the farm with a team of horses or a tractor. This practice has many advantages and, for most Queensland pig raisers, this type of single portable house will be found the most serviceable.

Portable houses can be moved from one paddock to another when crops are being grazed off by pigs, and the shed can easily be removed from one part of a paddock to another, in order to sweeten up the ground or to allow cultivators to work.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3 by 2-inches hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

Fences

The class of fence to be used on each farm will be governed mainly by the available material for its construction.

Pig fences need to be from 2 feet 6 inches to 4 feet in height, depending on the class of pigs to be enclosed. Large boars and sows sometimes have a tendency to jump fences, and for such animals a 4-feet fence would be necessary; however, a fence 3 feet high is usually sufficient to control pigs of all sizes, while young pigs are usually kept in their places by 2 feet 6 inch fences. To overcome this difference in the required heights of fences posts should be put 4 feet out of the ground so that the height of the fence may be raised to 4 feet, if necessary, by the use of extra barbed wire.

With pig pens it is a fairly constant rule that the smaller the pen the more substantial fences must be, the reverse also holds.

It is usually advisable to have a line of barbed wire, either on the ground level or a few inches below to prevent pigs from rooting under fences; logs or stones can sometimes be used to the same purpose.

The posts of pig fences should never be placed more than 10 feet apart, and 8 feet would be better. Several types of fences are satisfactory under certain conditions:—

Post and three-rail fences are most serviceable for large pigs, and can be made proof against small pigs by the addition of wire netting 18 inches high. This fence, however, is only suitable where timber is cheaply available and where there is not so much risk of fire and white ants.

Posts and wire netting alone seldom make a good fence except for weaner pigs, as the wire sags and is easily torn by large pigs. However, wire netting of stout gauge is useful in patching up other fences, such as ordinary cattle fences, to make them pig proof.

The post and two-rail fence covered with split or sawn palings is suitable for some piggeries. The palings should be strapped on with hoop iron at the top and bottom. As is the case with all wooden fences, there is a danger of fire and white ants. The paling fence has the advantage of acting as a break-wind in the piggery.

The other type of paling fence where either sawn or split palings are used and are held in position between two interwoven plain wires at the top and bottom of the posts is very common and very useful where timber is plentiful. Saplings or slabs may also be used in the same fashion, interwoven with the two wires top and bottom. Perhaps the most satisfactory fence for pig paddocks is woven wire, which can be purchased at reasonable prices from hardware stores. Woven wire is made in various designs and especially for pig paddocks, some having a barbed wire at the bottom. The height of woven pig wire is about 2 feet 6 inches; this is sufficient for young stock, and if it is desired to increase the height of the fence, extra barbed wires may be placed above the woven wire. The panels of woven wire should not be more than 10 feet.

The use of a few extra barbed wires is to be recommended on the fence of the boar pen.

A fence made of seven or eight barbed wires suitably placed on the posts is fairly satisfactory, but it is objectionable where young pigs are penned as a scratch from barbed wire is often carried by the young pigs to the bacon factory, and there shows up as a disfiguration on the carcass. Where wire fences are used it is advisable to either reinforce them or replace them by wood at the feeding end of the paddocks as there is most wear and tear on this part of the fence.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time, that is, sufficient space should be provided at the trough for each pig, an average space of 10 inches should be allowed for adult pigs. Also troughs should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made they should be of a size which allows of them being easily carried on to new ground. With stationary troughs it is essential that they should be built on to a floor of concrete or brick to prevent the pigs from making an objectionable mud wallow beside the trough. Wooden slabs placed on the ground beside the feeding trough are very unsanitary even if they do keep the pigs out of the mud. Spilt food and drainage collects under the slabs and causes an objectionable odour. The feeding floor should always be of an impervious nature.

The most serviceable troughs are of concrete built into a concrete floor as shown in fig. 26.

The trough illustrated in fig. 26 is 14 feet in length and the width is 15 inches overall, having its sides of 2½-inch thickness, reinforced with barbed wire, lengthways. The trough is 5 inches deep and the inside width is 10 inches. The platform is 7 feet wide and 16 feet long and 4 inches in thickness, and is surrounded by a protective flange 4 by 2-inch hardwood, bolted together at corners to protect the edges of the platform from being broken away.

Improvements could be made to such a trough by making a bung in the end leading outside the pen to facilitate cleaning the trough. Also, if the end of the trough was projected outside the fence, food could be poured in from the outside. Iron bars of ½ inch thickness set into the concrete across the trough 10 inches apart prevent the pigs from fighting at the trough and also prevent pigs from rooting food out of the trough. In such a trough it is preferable to have all the internal corners rounded off in order to facilitate cleaning.

Movable troughs built of concrete are very serviceable in some circumstances.

The V-shaped wooden trough, as illustrated in fig. 27, is a very useful trough when concrete cannot be used. This type of trough can be made of varying sizes to suit requirements. One suited to general use is made of a 9 by 1 inch hardwood board and an 8 by 1 inch hardwood board secured by screwing or nailing together at right angles and the ends closed up by 9 by 1 inch hardwood boards. The timber must be sawn and tightly fitted to prevent leakages. A dressing inside and out of tar acts as a preservative on the wood, and also makes it watertight and more hygienic.

Cast and galvanised iron troughs of various designs are procurable from hardware stores, and these are quite satisfactory under certain conditions.

Self-Feeders.

In an interesting and informative article which appeared in the November issue of the "Queensland Agricultural Journal" in 1927, Mr. F. Bostock, now of the Hawkesbury Agricultural College, New South Wales, stated that—

> A "self-feeder" is simply a device by means of which a supply of grain or other feeds may be kept constantly available to the pigs in order that they may satisfy the cravings of their appetites.

Self-feeders, as illustrated, are practicable when grain is being fed, and for this purpose are intended for use more especially during the growing and fattening stages in the life of the bacon pigs, and are not specially recommended for use in feeding breeding sows, though even for this purpose the self-feeder may be used, but if so used the mixture of foods should be more nitrogenous (flesh-forming) than is usually given to baconers. This is because breeding sows in general only require a limited allowance of grain.

The two types of self-feeders, as shown in the plans (figs. 32 and 33), should be built on skids or runners to prevent pigs rooting at the floors and to facilitate moving. If strongly constructed this method of transport will be found to be much easier and quicker than loading the feeder into a wagon or on to a sledge.

Self-feeders should be designed primarily to keep an available supply of grain constantly before the pigs, and at the same time protect the contents against waste due to wind and rain.

It consists of a hopper to hold the food and a trough below, into which the grain is allowed to flow, the sliding and hinged flaps regulate the amount of grain permitted to flow into the trough as the pigs eat it.

The hopper is made sufficiently large enough to hold several days' supply of feed, and the inside walls should be as smooth as possible in order not to prevent the flow of grain into the trough.

When it is desired to feed two or more foods separately in the same self-feeder, a partition may easily be placed in the hopper at any distance from either end.

The self-feeder should be placed on a wooden or concrete platform if possible, and if well constructed with first-grade timber and given a coat of paint about once every twelve months should give service for quite a number of years.

According to American experiments there is very little doubt which method is the more economical, and as shown by the results of a number of experiments the self-feeder system is advantageous in every respect. Its use results in larger daily gains in live weight, bringing the pigs to marketable weights at an earlier date, and although the feed is consumed more rapidly there is an actual saving in the amount of feed required to produce 100 lb. of gain. This is a fact of extreme importance and is well worth consideration.

Last, but not least, one of the advantages to be gained is the saving of time and labour. At the same time the farmer must not neglect the self-feeder; because he has filled the hopper with grain he cannot afford to forget about it. The old adage, "The eye of the master fattens his cattle," holds good when applied to the self-feeding of pigs. There are a number of things which may happen to the self-feeder if left without attention. For instance, the feed may block in the hopper, thus leaving the pigs with a "dead" self-feeder, or the feed may become soiled in the trough, making it unpalatable to the pigs.

A self-feeder is by no means a substitute for the knowledge of feeding. The self-feeder may be adapted to the feeding of any kind of grain, although shelled grain and ground foods are most commonly used. It may be used to feed maize on the cob, but in this case the feeder would be required to be of a larger size than shown in accompanying plans in order to hold sufficient grain to feed a number of pigs for several days without refilling.

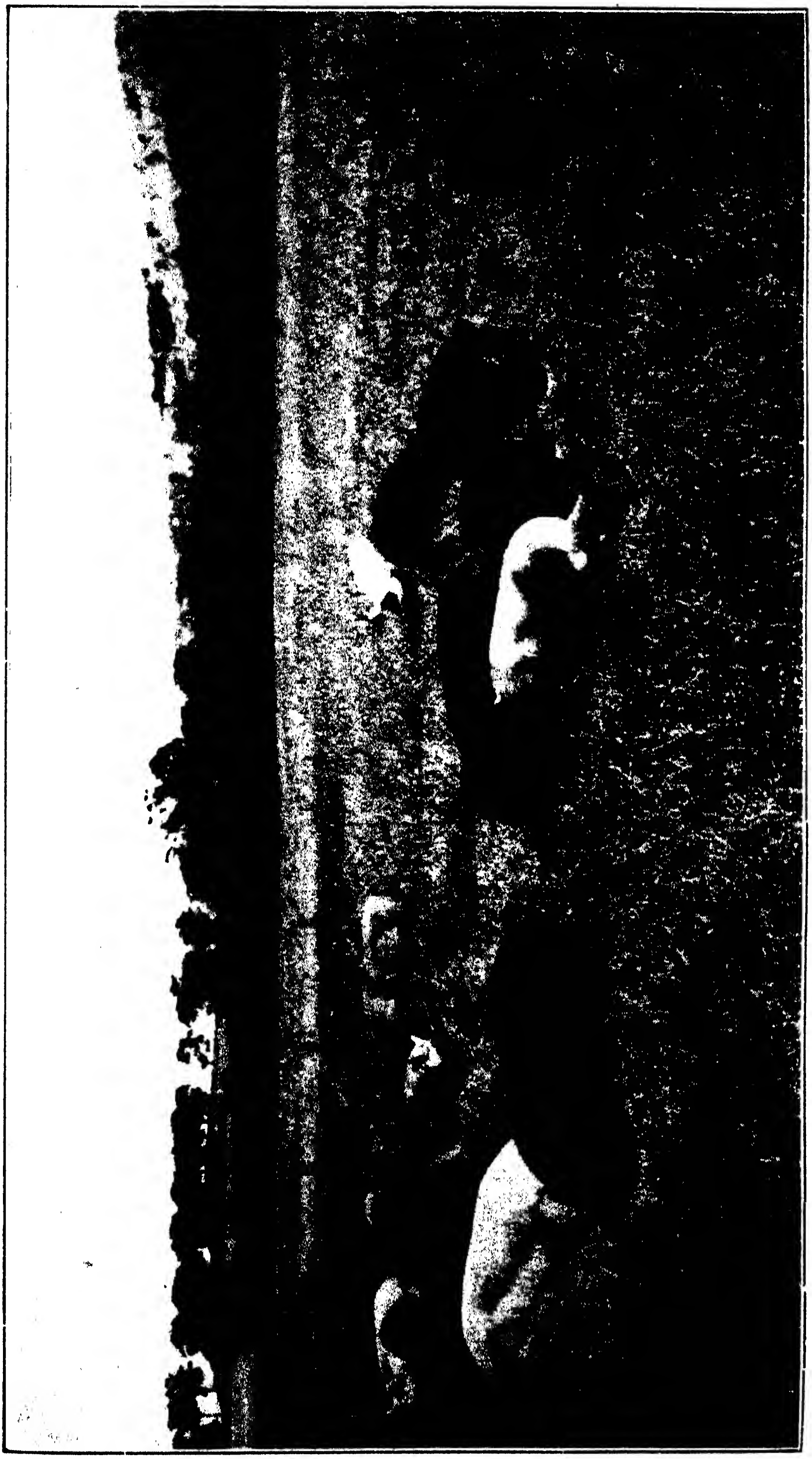
Maize meal or barley would require a smaller opening to prevent too rapid a flow of grain than would, say, whole maize. It will be noted in the plans that the sliding and hinged flaps have been fitted with thumb screws so as it may be adjusted to suit the type of grain being fed.

Shades.

Pigs should be provided with ample cool shade in hot summer months, and this can be done by either planting shrubs or hedges or by building a framework of 3 by 2 inches hardwood and covering the top with bushes or thatching with grass. Where a clump of natural scrub can be left in the pig paddock, good shade is provided where the pigs can burrow away into the cool and sleep during the hottest part of the day.

Oiling Post.

An occasional application of oil to the pig's skin keeps it in a soft and healthy condition, and at the same time the oil destroys lice and other external parasites on the pig. A convenient self-oiler can be made by wrapping a bag or a rope around a post or a tree in the runs from the ground level up to a height of 2 feet, the bagging or rope is kept saturated with oil, and the pigs oil themselves by rubbing against the post. A mixture of six parts of waste oil and one part of kerosene is very suitable for oiling pigs.



[Photo. by courtesy of Principal, Dookie Agricultural College, Vic.

PLATE 4 (Fig. 1).

Pigs are most contented when allowed the range of succulent pasture paddocks.

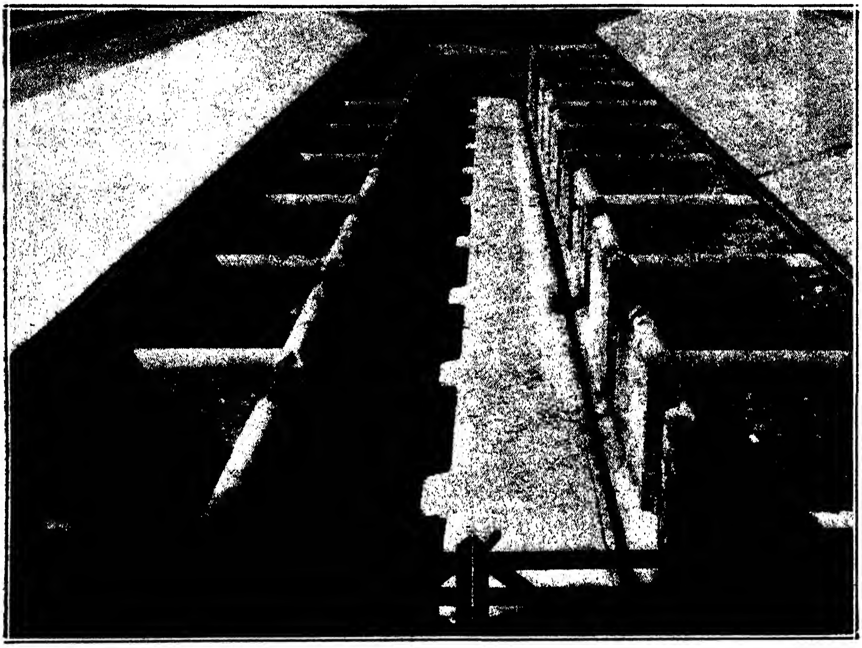


PLATE 5 (Fig. 2).
Piggeries, Mental Hospital, Goodna, Queensland, showing brick and concrete feeding pens, pathway, and drains.

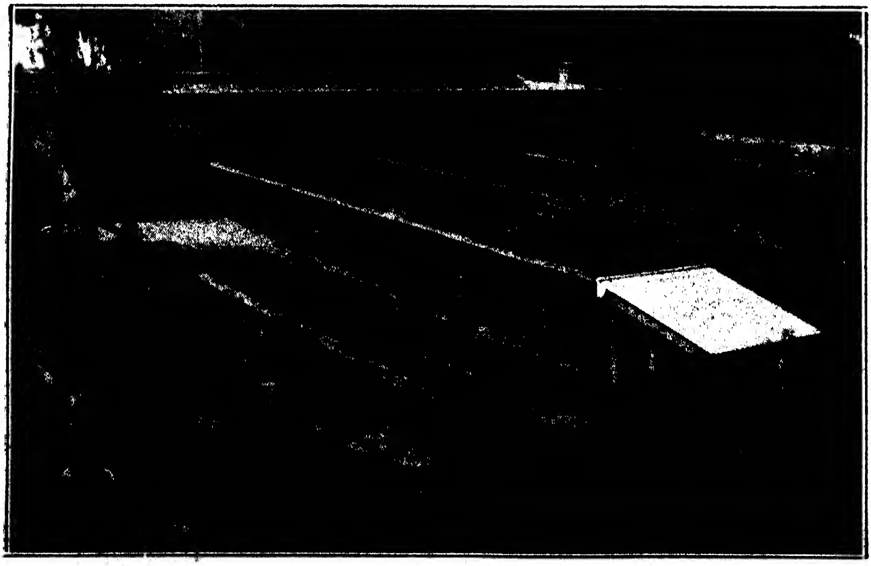


PLATE 6 (Fig. 3.)
Piggeries, Mental Hospital, Goodna, Queensland, showing exercise yards and shade at the rear of feeding and sleeping pens.

[*Photo.: N. S. W. Government Printer.*]

PLATE 7 (Fig. 4).

Section of Concrete Piggeries at the Hawkesbury Agricultural College, Richmond, N.S.W. This type of Piggery is suitable for suburban farms.

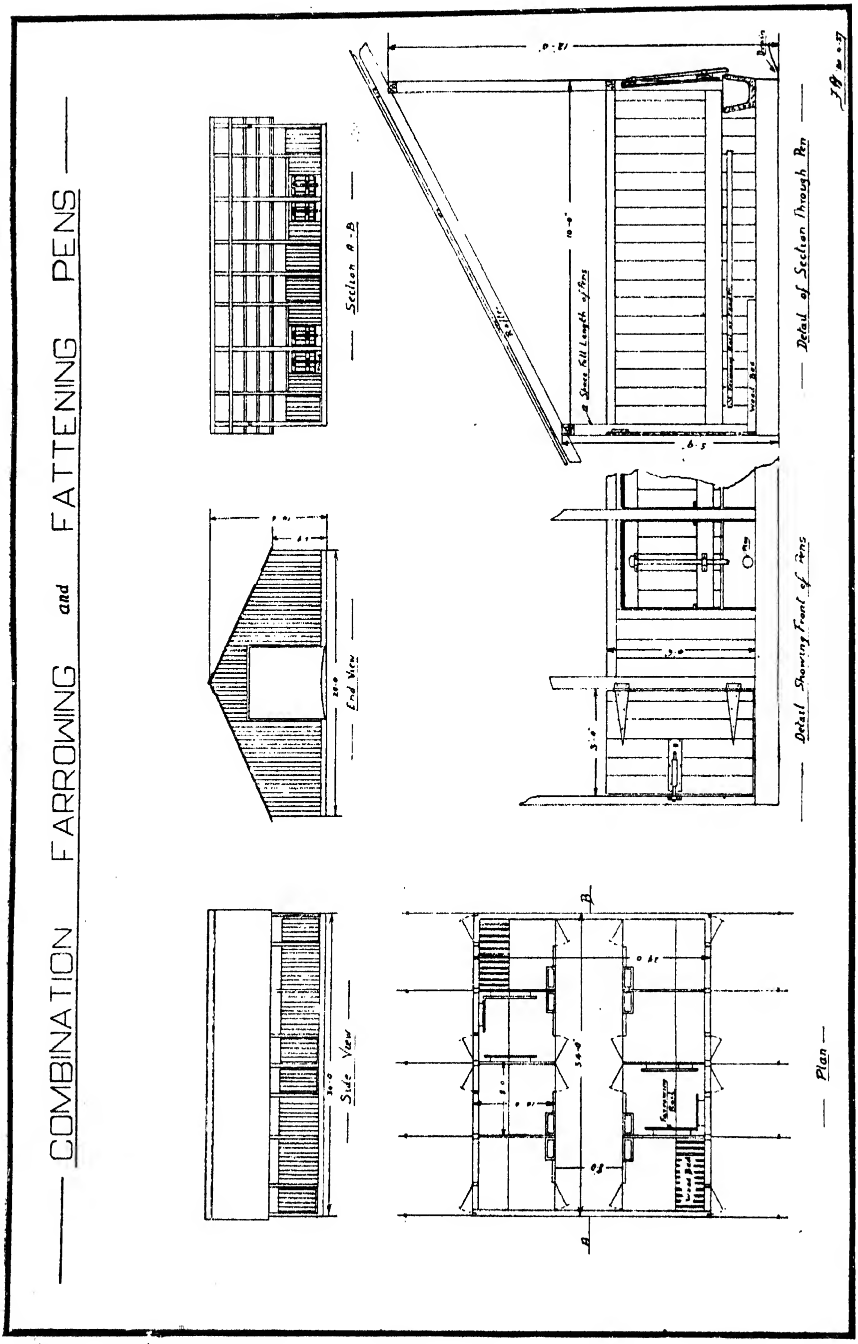

COMBINATION FARROWING and FATTENING PENS
Section A-B
End View
Side View
Plan
Detail of Section Through Pen
Detail Showing Front of Pens
Roller
Wood Bed
Farrowing Rail
Drain

PLATE 8 (Fig. 5).

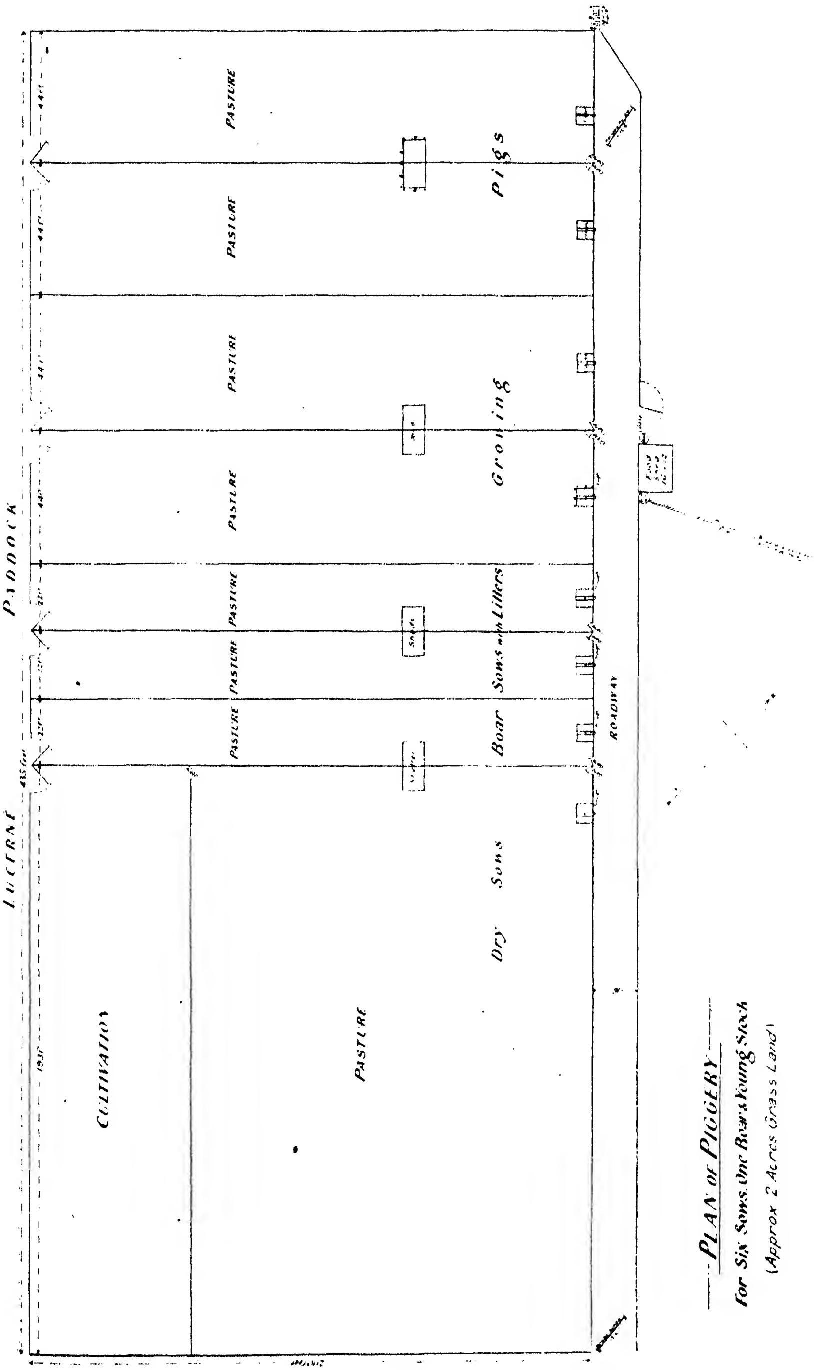

LUCERNE PADDOCK
PASTURE
PASTURE
PASTURE
PASTURE
PASTURE
PASTURE
PASTURE
Pigs Growing
Sows with Litters
Boar
Dry Sows
CULTIVATION
PASTURE
ROADWAY
PLAN OF PIGGERY
For Six Sows, One Boar & Young Stock
(Approx 2 Acres Grass Land)

PLATE 9 (Fig. 6).

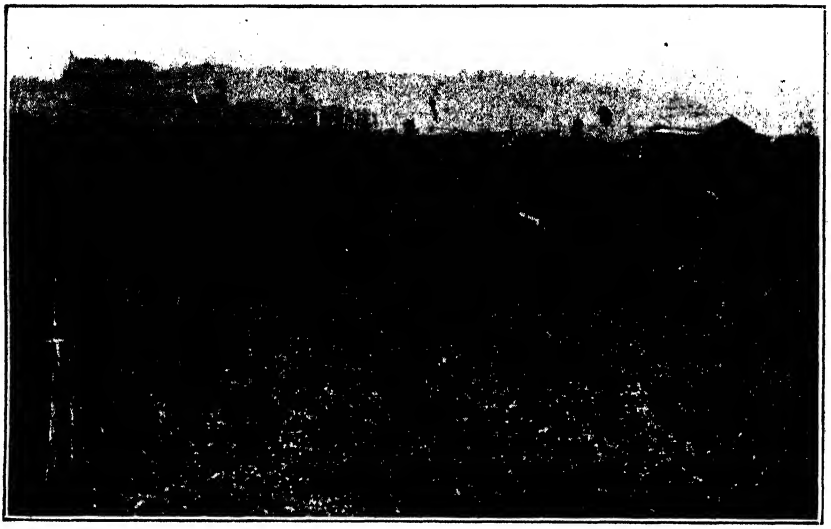


PLATE 10 (Fig. 7).

A section of the piggery at the State Farm, Kairi, Atherton Tableland, North Queensland, where pigs are run on lucerne and grass paddocks and provided with individual shelter sheds.

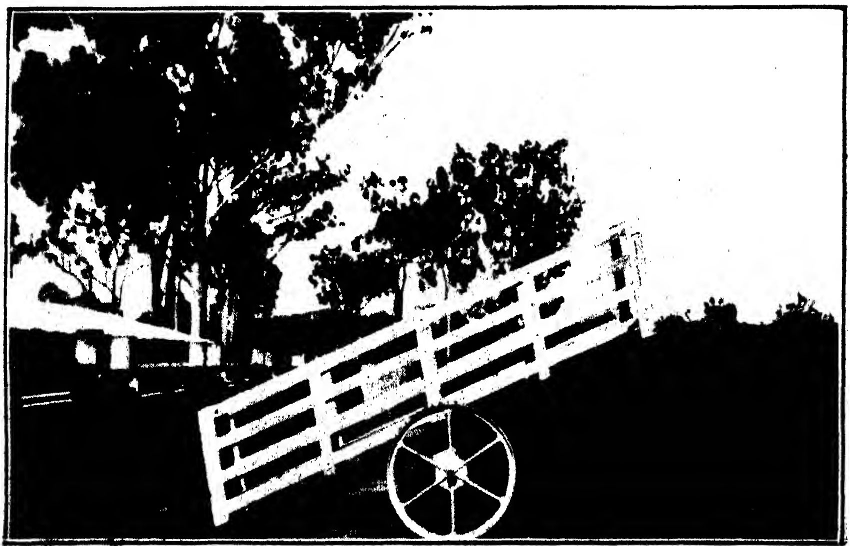


PLATE 11 (Fig. 8).

A useful type of portable loading race.

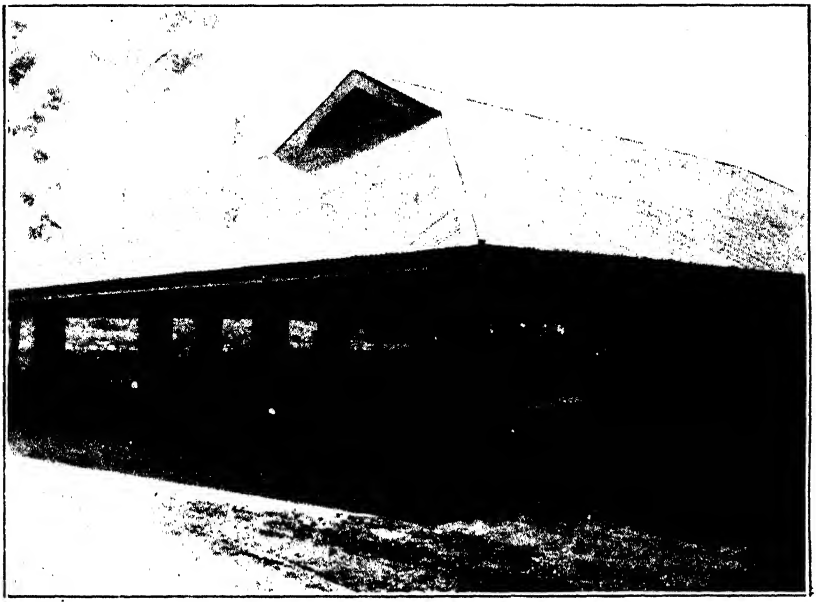


PLATE 12 (Fig. 9).

The central pig house in use at the Mental Hospital, Goodna, Queensland. This house has two rows of pens, with a passage and drains down the centre.

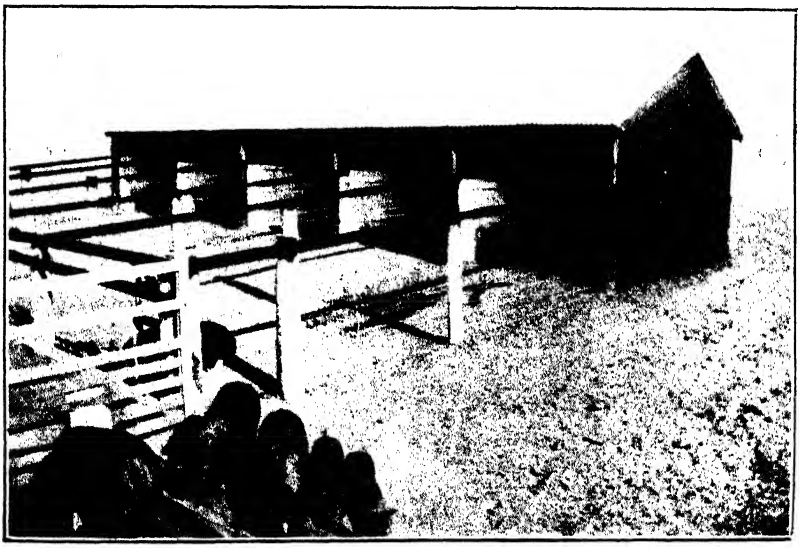


PLATE 13 (Fig. 10).

An attractive pig shed and yards on a Queensland farm.

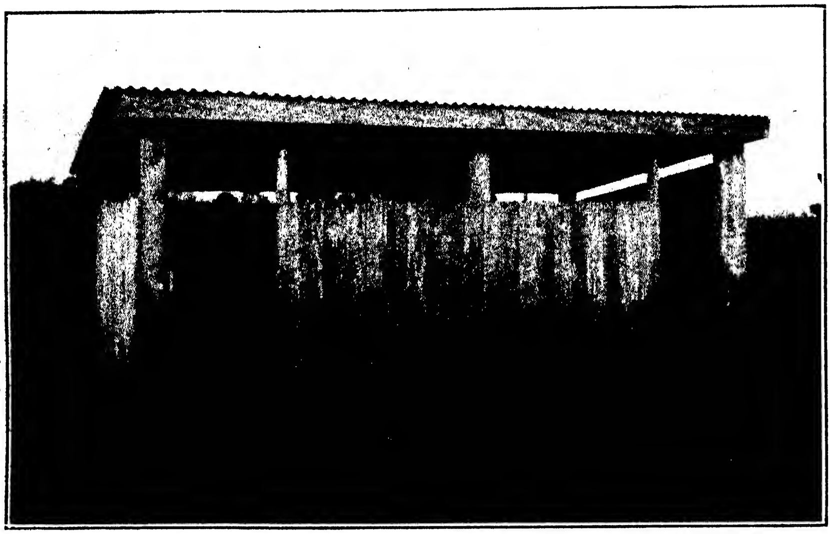
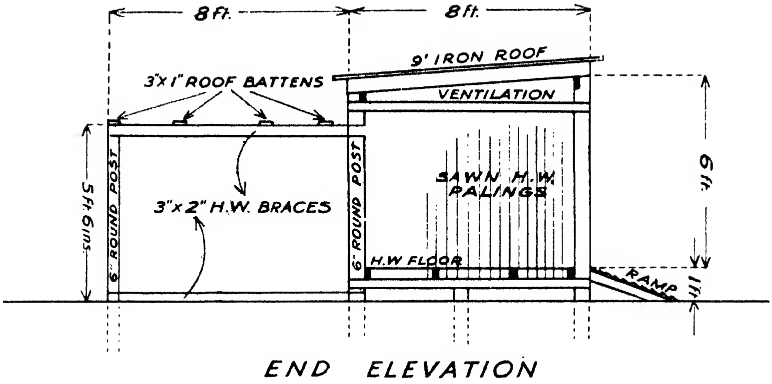


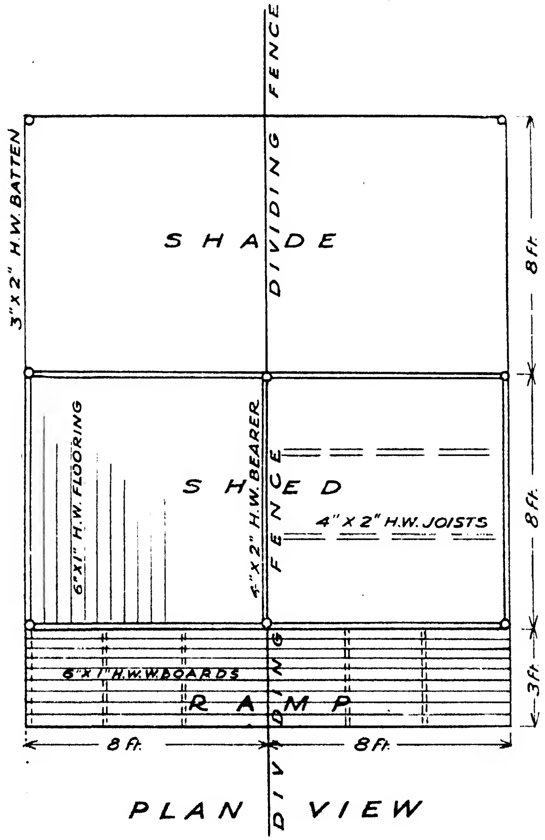
PLATE 14 (Fig. 11).

Pig shed at the Kairi State Farm, Atherton Tableland, North Queensland. On account of the wet climate in that region the front of this shed is partially closed. It will be noted, however, that ample ventilation space is provided at the top of the walls.

PLATE 15 (Fig. 12).

Double Pig Shed, divided by fence, at the Hawkesbury Agricultural College, Richmond, N.S.W. Note also the well constructed fences and shade trees for comfort of stock.





OPEN FRONTED SHELTER SHEDS FOR PIGS
Being a Double Shed with a Dividing Fence
Ramp in Front and Brush Shade at Back

PLATE 16 (Fig. 13).

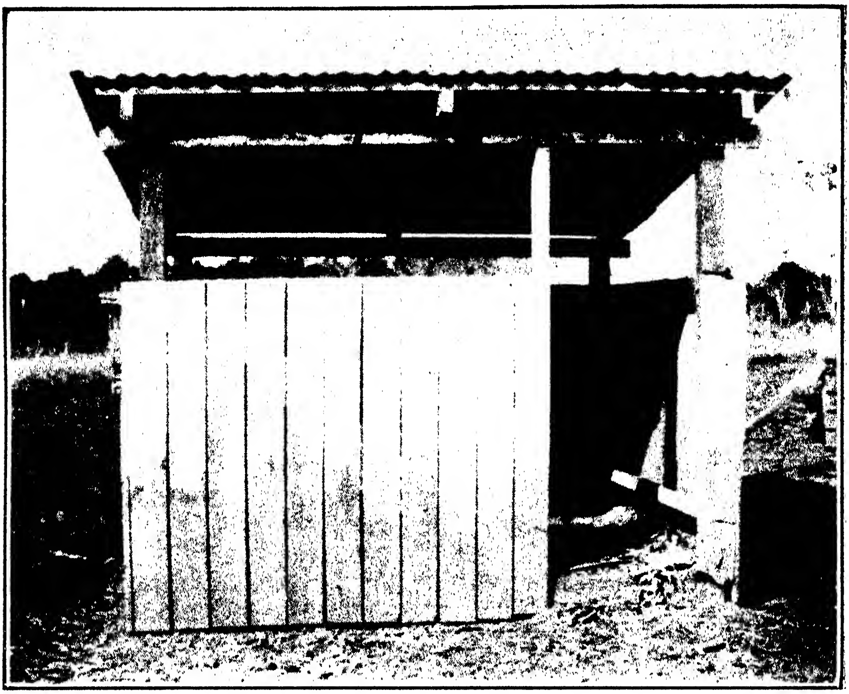


PLATE 17 (Fig. 14).

A single shed in use at the State Farm, Kairi, North Queensland. This shed is a fixture; its measurements are:—Floor, 9 ft. x 9 ft.; front, 6 ft. high; back, 5 ft. high.

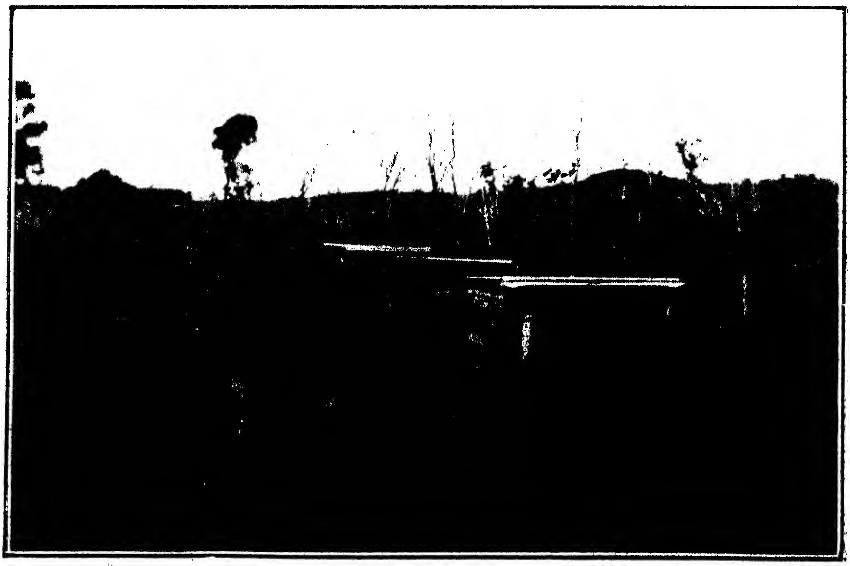
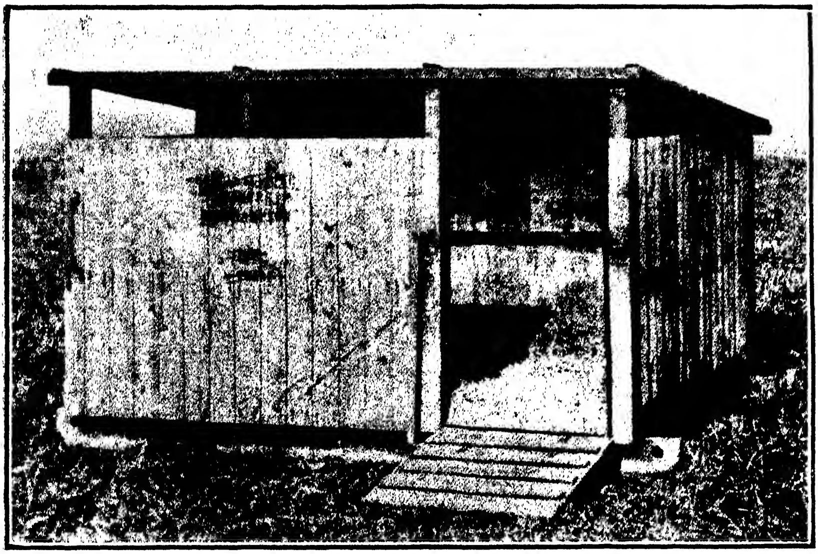


PLATE 18 (Fig. 15).

A neat set of Single Sheds on the farm of W. Koehler, Yamsion, *via* Dalby, Q.



[*Photo.: Ministry of Agriculture and Fisheries, Pig Keeping Publications, London.*]

PLATE 19 (Fig. 16).

Portable Pig Shed photographed on an English farm. A convenient type for Queensland conditions.

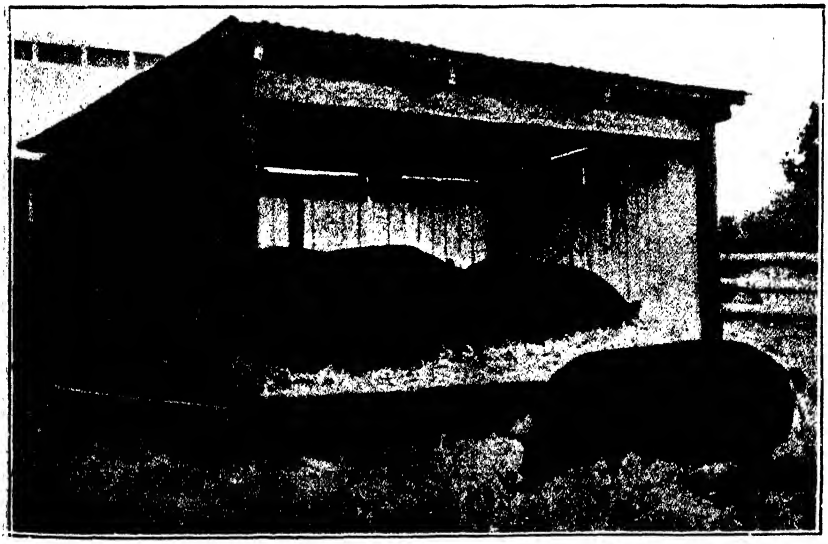


PLATE 20 (Fig. 17).

Open-fronted shelter shed at the Hawkesbury Agricultural College, Richmond, N.S.W. Berkshire Sows enjoying the advantages of this type of shed, which is suitable for most Queensland Pig Farms.

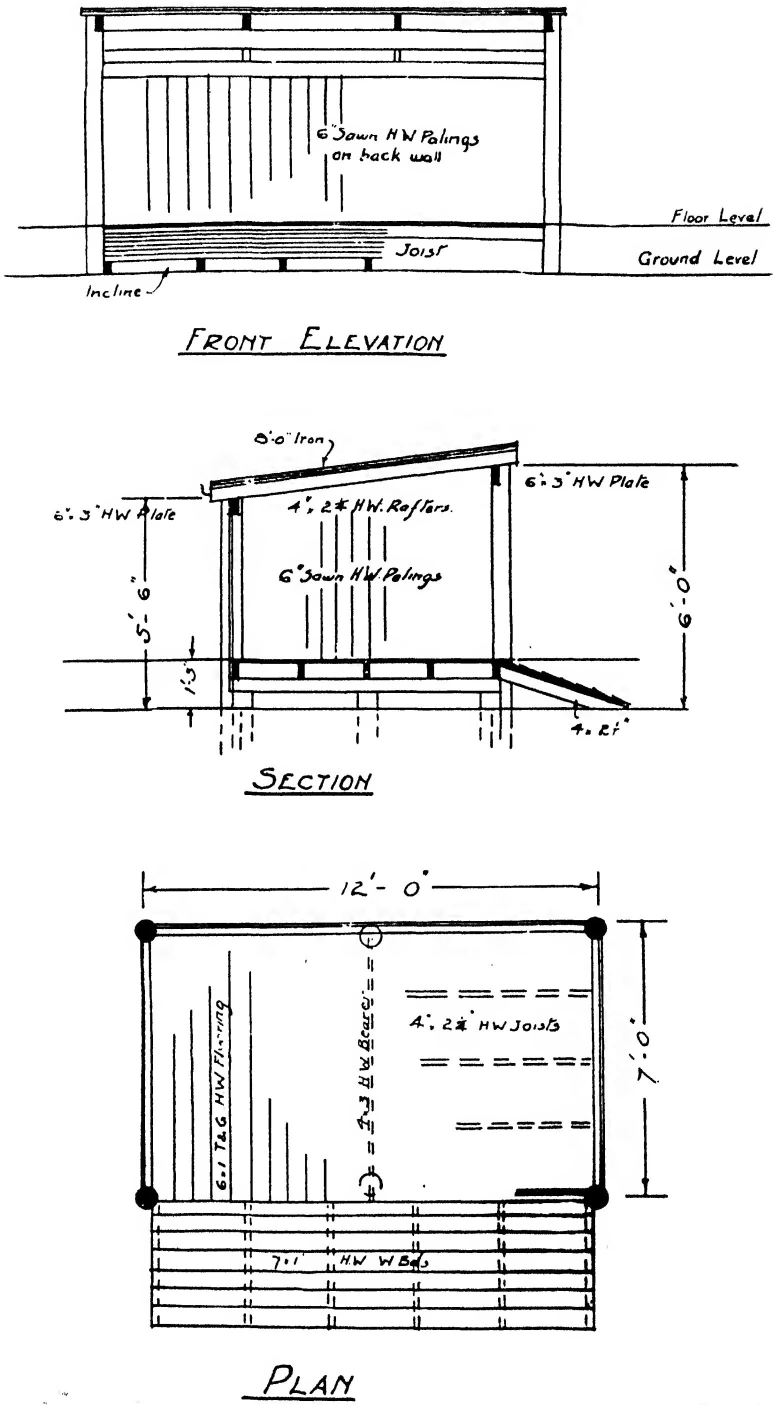


PLATE 21 (Fig. 18).
Plan for shed as shown in Figure 17.

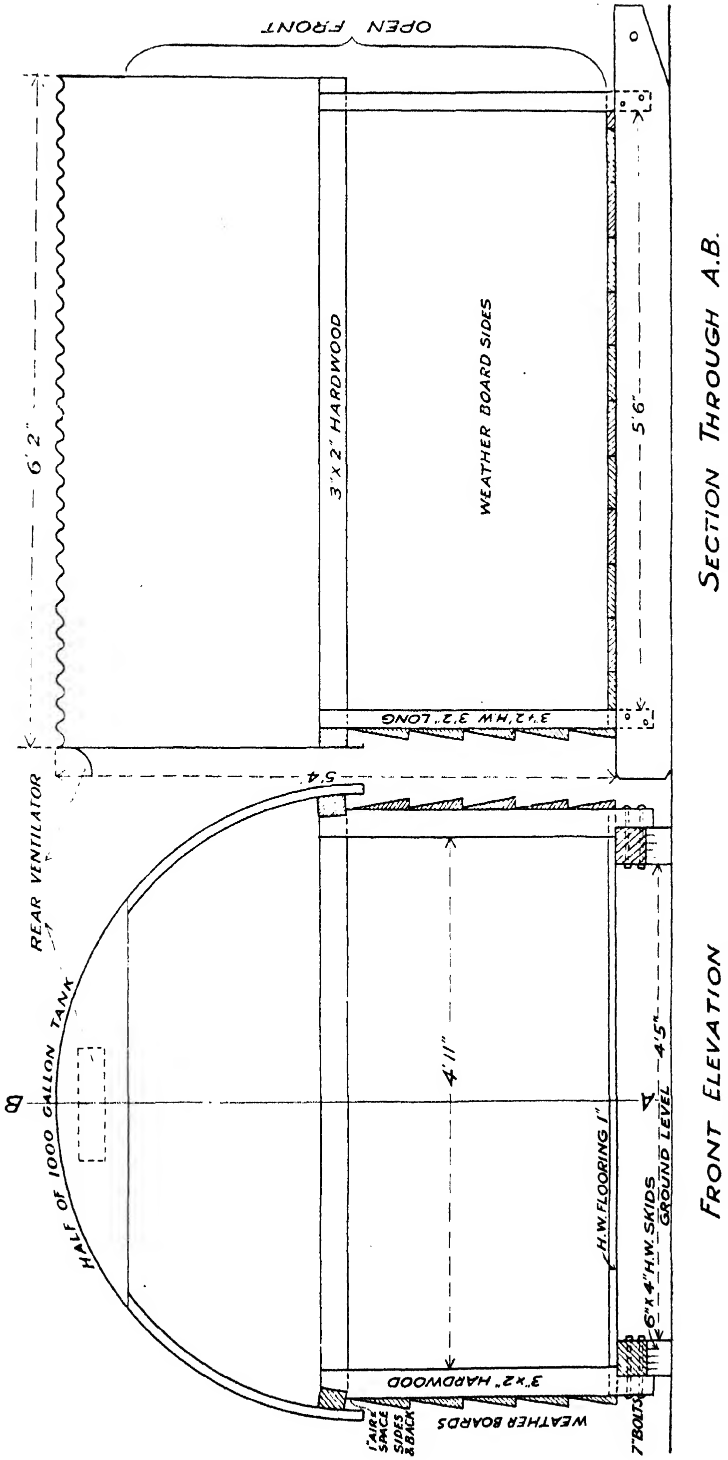


Plate 22 (Fig 19.)—Plan of A1 Portable Shelter Shed, using Half a Water Tank.

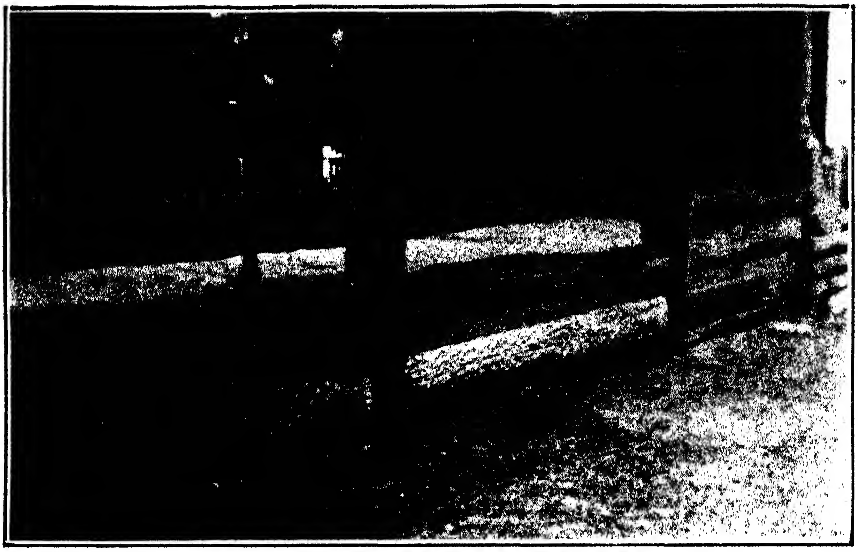


PLATE 23 (Fig. 20).
A substantial pig fence of three rails, made to hold young pigs by the addition of wire-netting to a height of 18 inches.

PLATE 24 (Fig. 21).
Woven wire fence strengthened by the addition of wire-netting and barbed wire.

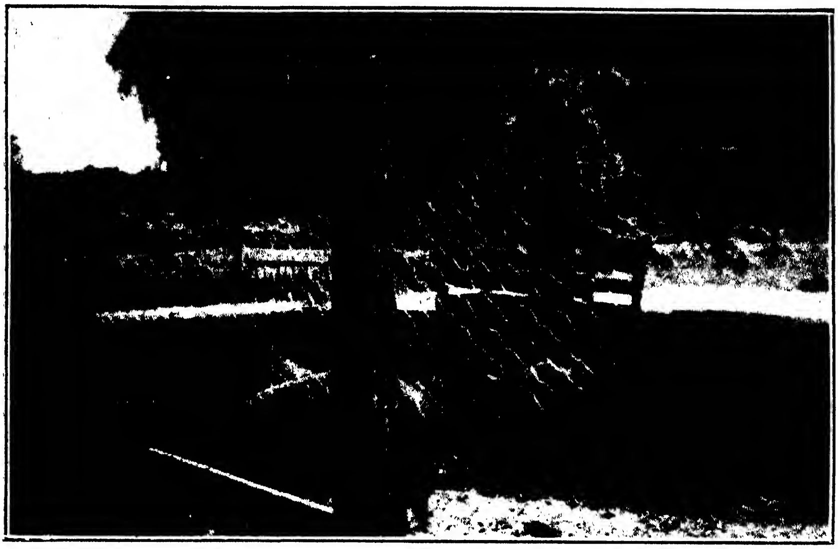


PLATE 25 (Fig. 22).
Wire-netting fence, useful for enclosing small pigs.

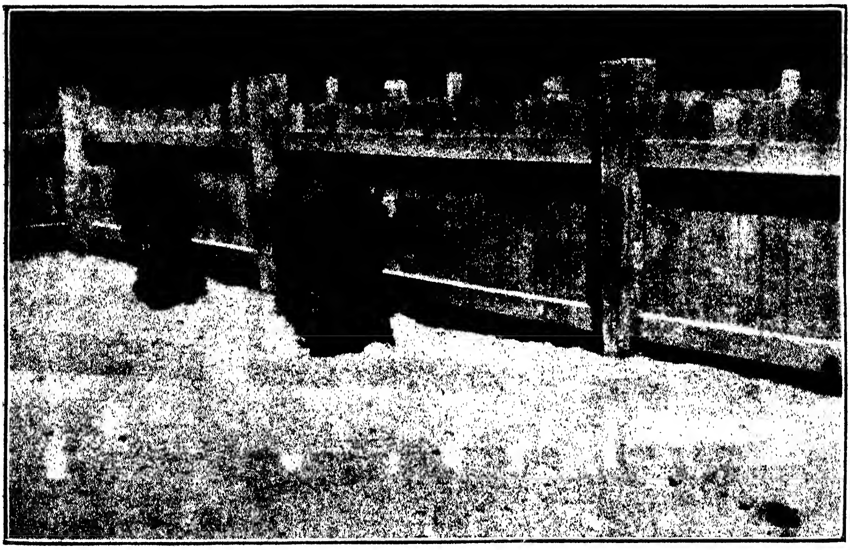


PLATE 26 (Fig. 23).
A most serviceable fence of two rails and sawn palings. This class of fence can be used to advantage for small yards or enclosing large pigs.

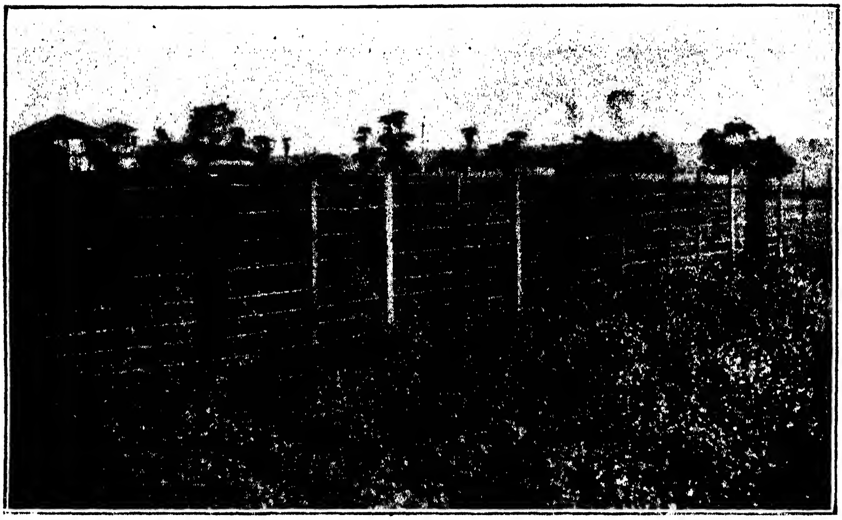


PLATE 27 (Fig. 24)

This fence is made of 7 plain wires and a barbed wire at the bottom, posts are 10 feet apart, with four wooden droppers to each panel. It is suitable for holding large pigs, and the plain wires being through the posts can easily be strained when necessary.

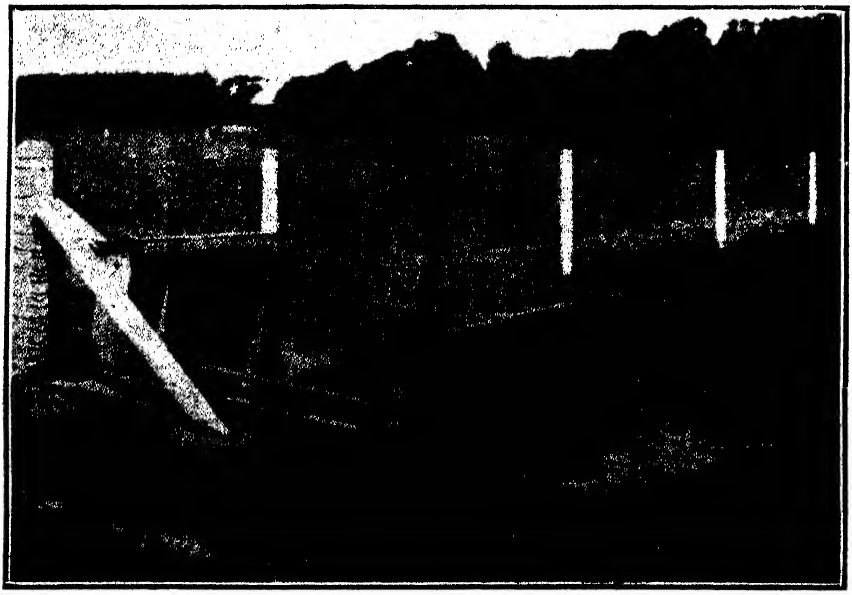


PLATE 28 (Fig. 25).

A Woven Wire Fence.—Note the wooden creep for feeding young pigs apart from the sow. This creep is so constructed that the suckers can get into the feeding pen, but the sow is blocked out; this permits of the suckers being fed a little extra food prior to weaning.

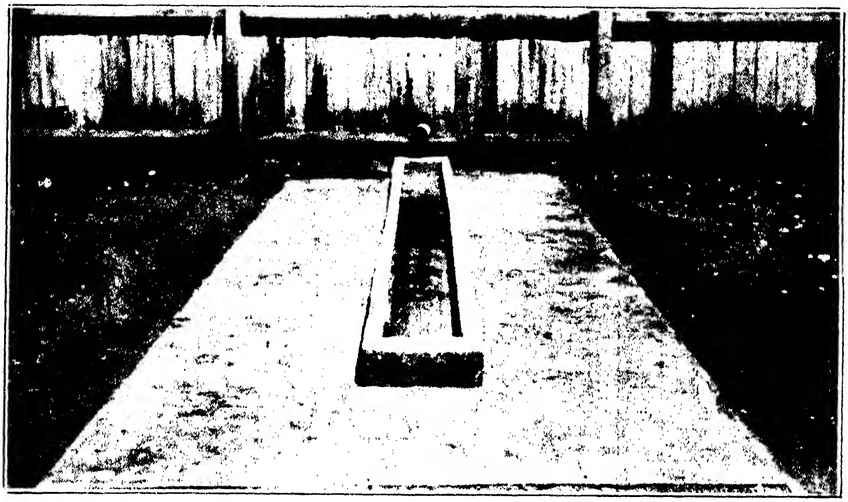


PLATE 29 (Fig. 26).
Concrete food trough and platform.

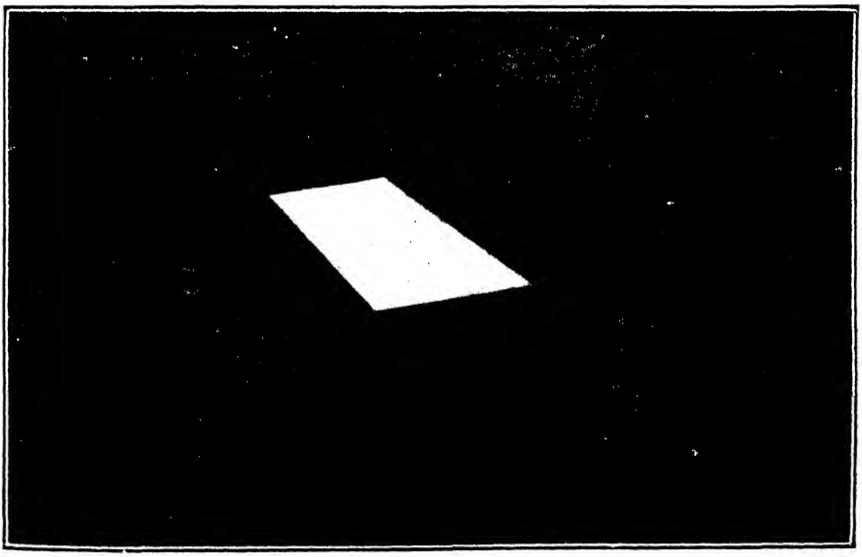


PLATE 30 (Fig. 27).
Breakfast is served. A handy V-shaped wooden trough.

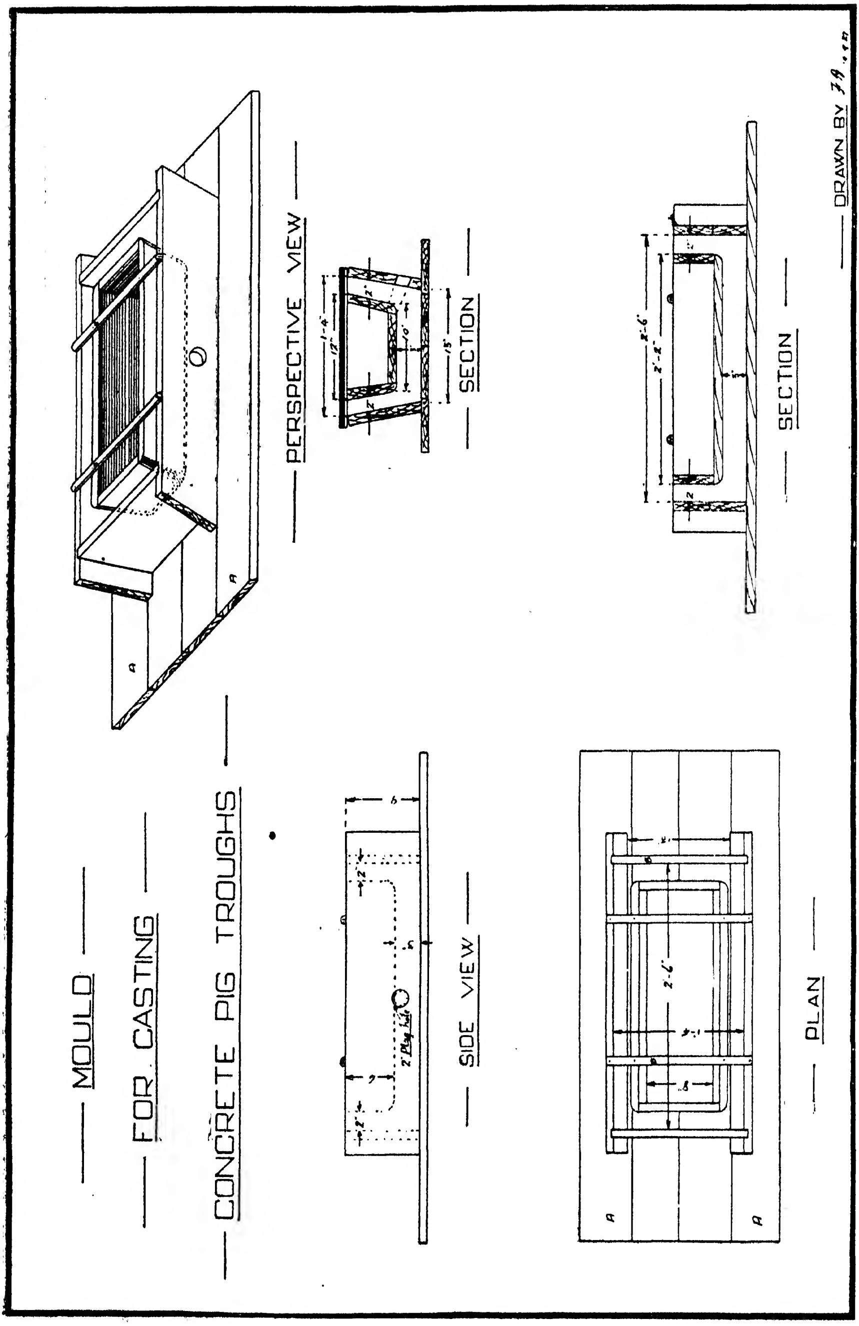


PLATE 31 (Fig. 28).

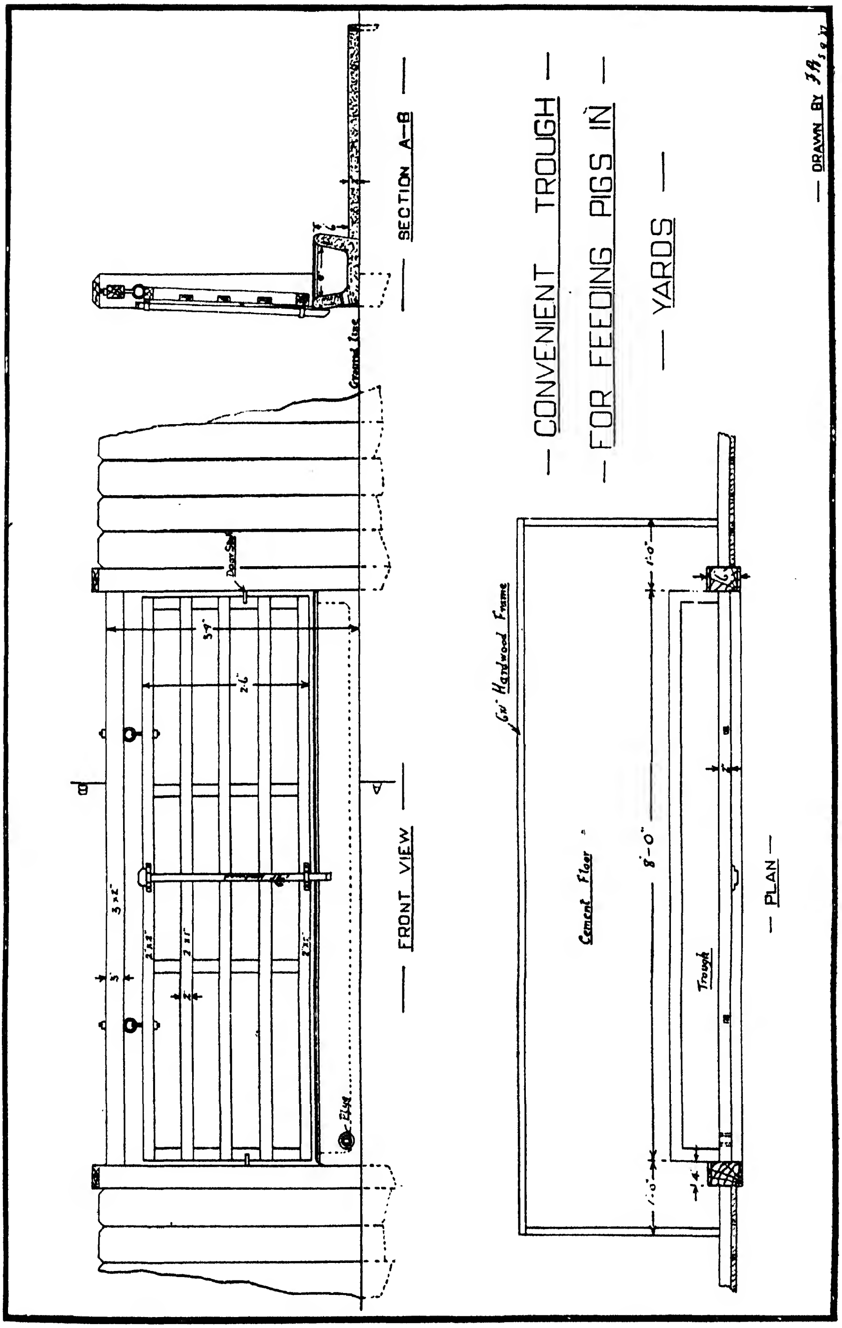


Plate 32 (Fig. 29).

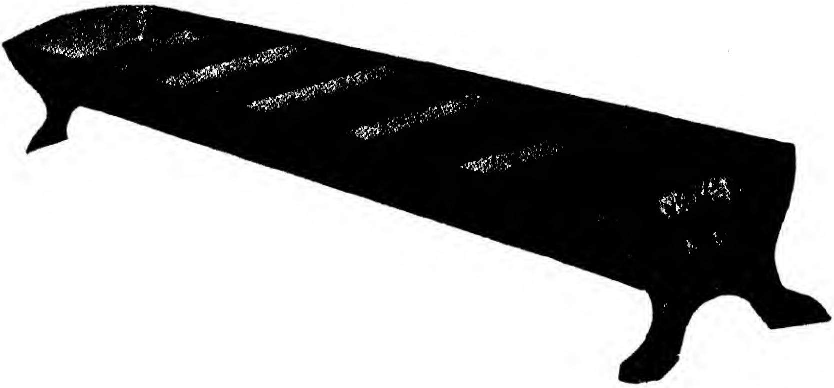


PLATE 33 (Fig. 30).
Steel pig trough, with cast iron ends, for feeding six pigs. Weight is about 40 lbs.

PLATE 34 (Fig. 31).
Feeding time for the Pig Farm Pets.

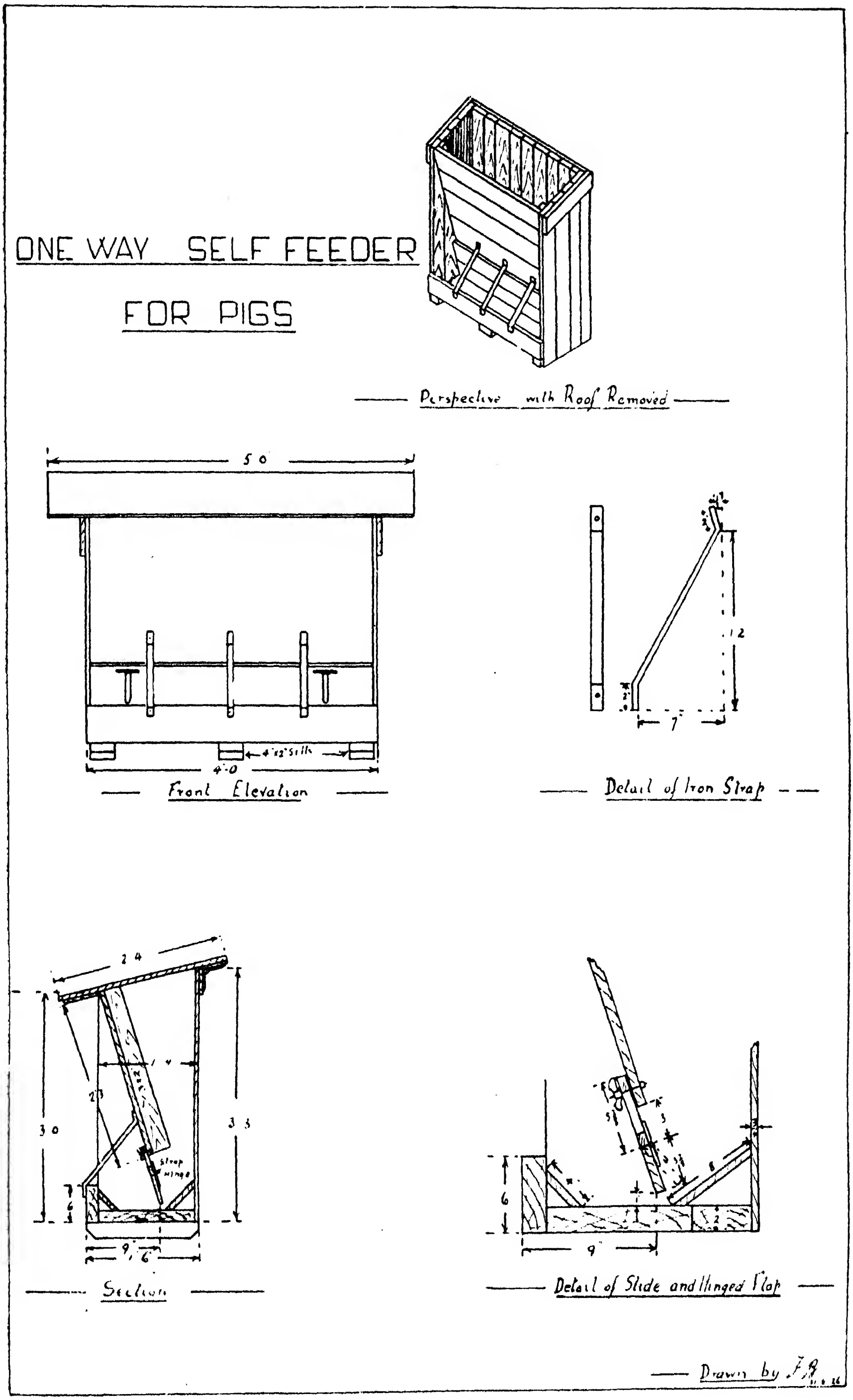


PLATE 35 (Fig. 32).

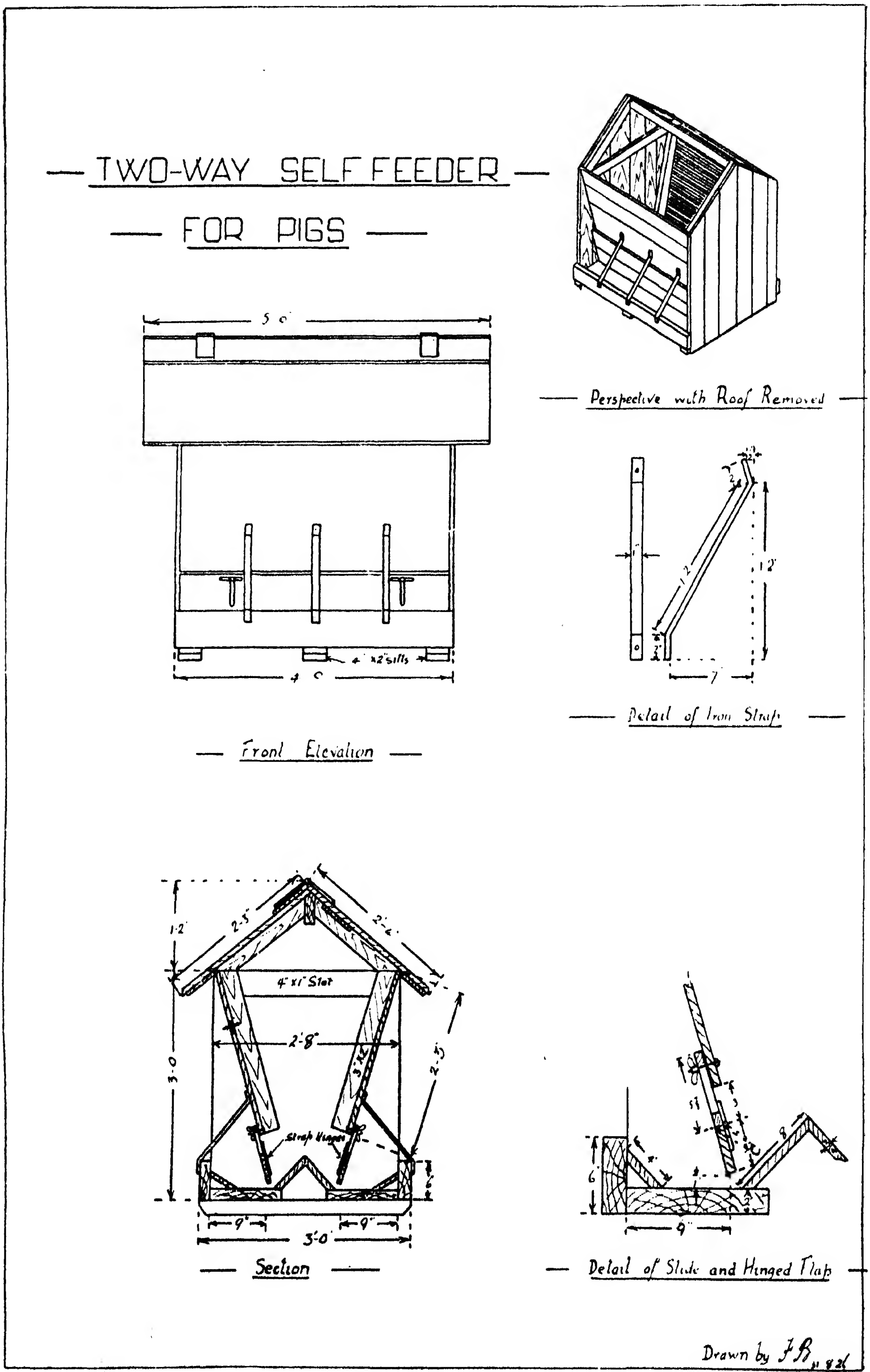


PLATE 36 (Fig. 33).

ONE-WAY SELF-FEEDER FOR PIGS—MATERIAL REQUIRED.

PLATE 35 (Fig. 32).

Members.	Number.	Length.	Size.	Material.
Skids	Three ..	1 ft. 6 in.	4 in. x 2 in.	Hardwood
Trough	One ..	4 ft. ..	6 in. x 2 in.	Pine
Trough	One ..	3 ft. 10½ in.	12 in. x 2 in. ..	Pine
Trough	One ..	3 ft. 10½ in.	4 in. x 2 in.	Pine
Trough	One ..	3 ft. 10½ in.	8 in. x ¾ in.	Pine
Trough	One ..	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Front Panels	Five ..	3 ft. 10½ in.	6 in. x ¾ in., T. & G.	Pine
Front Panels	Two ..	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flaps	Two ..	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Ends and Back	Twenty-four	3 ft. 3 in.	6 in. x ¾ in., T. & G.	Pine
Ends and Back	One ..	7 ft. ..	6 in. x ¾ in.	Pine
Top	Ten ..	2 ft. 4 in	6 in x ¾ in., T. & G.	Pine
Top	Two ..	5 ft. ..	6 in. x ¾ in.	Pine

Hardware.

Three 1-inch by ¼-inch iron straps.

Six 3-inch strap hinges.

Two 3-inch by ½-inch bolts with thumb nuts

Nails, &c.

TWO-WAY SELF-FEEDER FOR PIGS.—MATERIAL REQUIRED.

PLATE 36 (Fig. 33)

Members.	Number.	Length.	Size.	Material.
Skids	Three ..	3 ft. ..	4 in. x 2 in.	Hardwood
Trough	Two ..	4 ft. ..	6 in. x 2 in.	Pine
Trough	Two ..	3 ft. 10½ in.	12 in. x 2 in. ..	Pine
Trough	Two ..	3 ft. 10½ in.	8 in. x ¾ in	Pine
Trough	Two ..	3 ft 10½ n	4 in. x ¾ in.	Pine
Panels	Ten ..	3 ft. 10½ in.	6 in. x ¾ in., T. & G.	Pine
Panels	Four ..	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flap	Four ..	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Ends	Twelve ..	4 ft. 2 in.	6 in. x ¾ in., T. & G.	Pine
Frame of Roof	One ..	4 ft. ..	6 in. x 2 in.	Pine
Frame of Roof	Four ..	1 ft. 9 in.	3 in. x 2 in.	Pine
Frame of Roof	Two ..	2 ft. ..	4 in. x 1 in	Pine
Roof	Twenty ..	2 ft. 4 in.	6 in. x ¾ in., T. & G.	Pine
Roof	Four ..	5 ft. ..	6 in. x ¾ in.	Pine

Hardware.

Six 1-inch by ¼-inch iron straps.

Eight 3-inch strap hinges.

Two 5-inch strap hinges.

Four 3-inch by ½-inch bolts with thumb nuts.

Nails, &c.

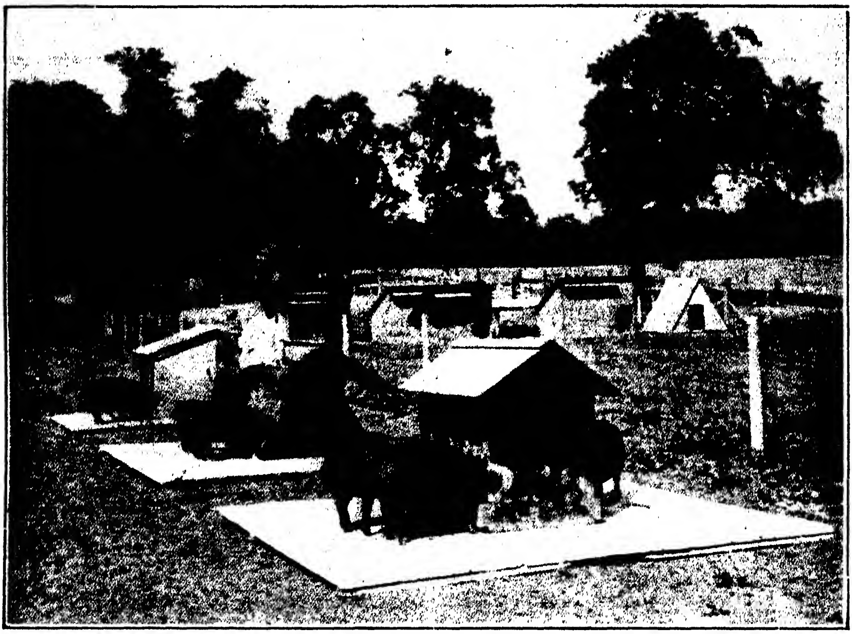


PLATE 37 (Fig. 34).
Self Feeders on an American Pig Farm. Note that the feeders are placed on wooden platforms for cleanliness.

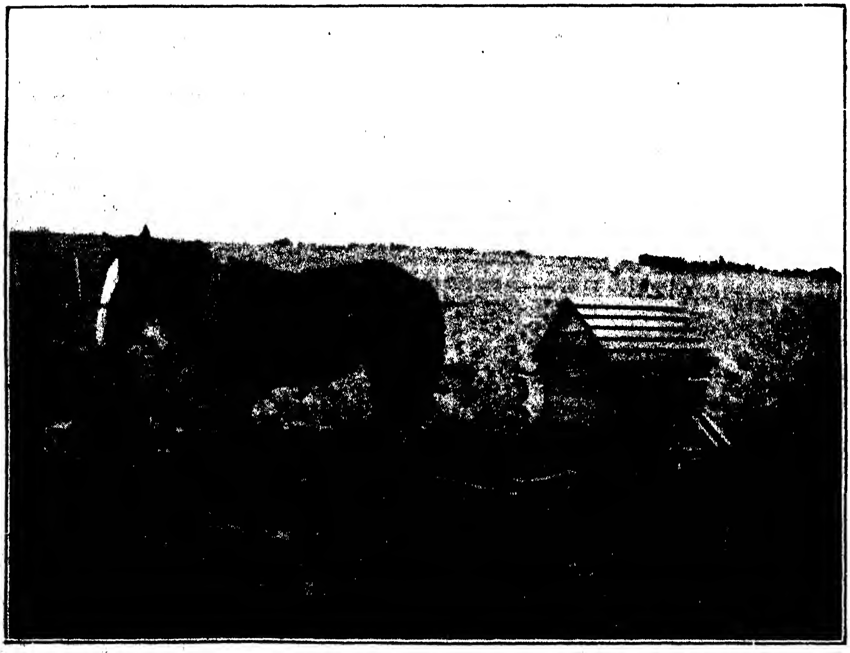
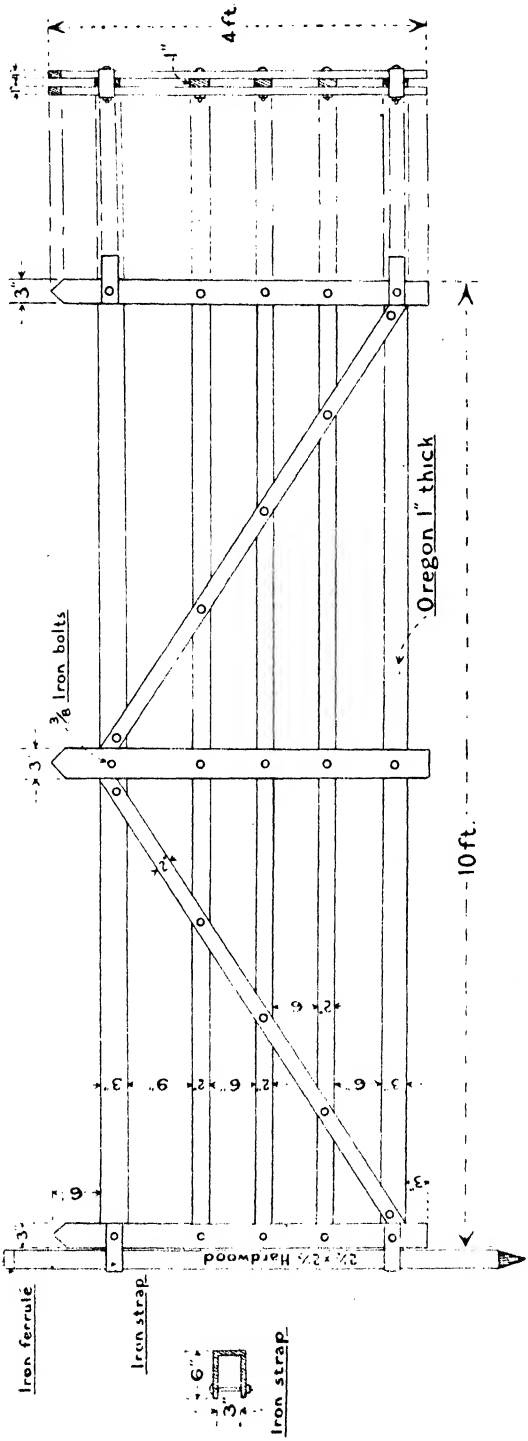


PLATE 38 (Fig. 35)
Self Feeder on Skids ready for Transport.



Movable Pig Hurdle

PLATE 39 (Fig. 36).

PLATE 40 (Fig. 37).
Berkshire Sows enjoying the shelter provided by the Budelia shrub at the Farm Home for Boys, Westbrook, *via* Toowoomba.

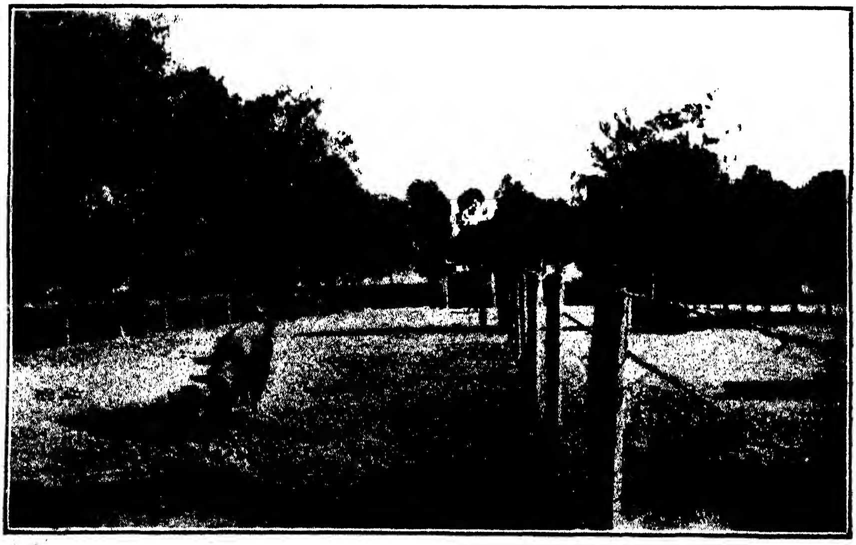


PLATE 41 (Fig. 38).
Shady pig yards at Hawkesbury Agricultural College, Richmond, New South Wales.

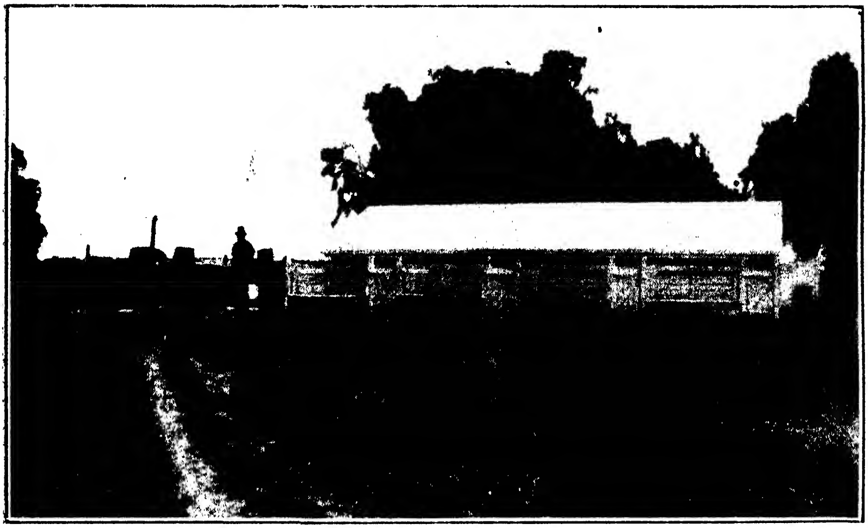


PLATE 42 (Fig. 39).
Piggery at the Dalby Sanatorium on Jimbour Plains.

PLATE 43 (Fig. 40).
Pig shed and paddock accommodation on farm of C. C. Low, North Arm, Queensland.

PLATE 44 (Fig 41).
Shed and paddock used by Walter Tully in his School Pig Club Work in the Mount Larcom District.

THE BACON PIG.

In an interesting article published in the "Journal of Agriculture," West Australia, Mr. G. K. Baron-Hay, Superintendent of Dairying, discusses in detail the position as it is in the pig industry in that State, where group settlements and other developmental schemes are in operation, and where considerable interest has been created in dairying and allied industries. That there is a very large opening in the West for enthusiastic pig farmers is clearly indicated in the statement that at present there is a local market for nearly a quarter of a million pounds worth of pork and bacon annually, the State's production last year being that much short of local requirements. There, as here, the number of pigs has fluctuated greatly from year to year, but has remained on the average constant, while the number of dairy cows has shown a continued interest. Mr. Baron-Hay indicates that this rapid fluctuation of the pig population is in itself an argument in favour of developing the pig industry, indicating as it does the capacity of the pig above all farm animals for rapid reproduction. The cow, it is stated, is only able to increase at a very slow rate in comparison, as is shown in the following table:—

	Annual Increase.
Cattle	80 to 90 per cent.
Sheep	95 to 115 „ „
Pigs	1,200 to 1,800 „ „

The article discussed the various problems responsible for fluctuation and for the apparent unpopularity of the pig industry, and deals in detail with fluctuation in prices of pig products, feeding stuffs, and the change of pig population from the wheat belt to the dairying districts of the State. The question of disease and its influence on the present and future position indicates that, in comparison, the pigs in the West are very healthy and that the risk of calamity should not check progress nor be other than a problem to face, for the percentage of pigs condemned for disease at the abattoirs is very light, the principal diseases being tuberculosis.

The Young Farmer.

FAT LAMB RAISING—A JUNIOR FARMER'S PROGRAMME.

Farmer Junior—the schoolboy of to-day and the wheatgrower, grazier, dairy farmer or fruitgrower of to-morrow—is an important factor in Australia's future, and it was a recognition of this that led to the institution of the Junior Farmers' Clubs of New South Wales, a movement that is also being fostered in Queensland. The club movement in the South commenced active operations about two years ago under the directions of a central council representative of interested departments and organisations, and with the good wishes of all concerned with the well-being of primary production.

That the movement is accomplishing valuable work there is no doubt. Some indication of its practical usefulness was afforded to those who attended the recent conference of the southern branches of the Agricultural Bureau at Albury, at which a special Junior Farmers' session was arranged. The chair was taken by Dudley Scholz, the president of the local club, and three papers were read by members. That the quality of these contributions was of a high standard the following extract, the concluding portion of Gordon Padman's paper on the subject of fat lamb raising, indicates. His plan to rear fat lambs would be:—

To use suitable rams—say Southdown or Suffolk.

To use the right type of ewe—big-bodied comeback or fine cross.

To have if possible flat country, hilly country, and cultivation.

To keep my ewes, before lambing, on the hilly country as much as possible, where they would not get too fat and would have to walk about a good deal.

To have good feed ready, by cultivation or otherwise, for the ewes when rearing their lambs, and to move them on to this good feed just before lambing so that they would have a good supply of milk for the young lambs.

To have all my paddocks of such a size as to enable the sheep to be moved from paddock to paddock frequently, thus keeping the grass short and fresh, and avoiding rank growth, which does not suit sheep.

To use my cultivation paddocks to grow green feed, and so make sure that my lambs would have plenty and would not be checked in growth.

To see that I got my lambs the right time of the year.

To make sure that my lambs would be offered for sale in a well-grown and prime condition, for I have noticed that good prime stock always brings good prices, while stock that is not good and prime sometimes has to be sold at prices that do not pay.

Finally, to see that the ewes and lambs were well supplied with a good salt lick.

Many much older farmers could not have outlined as sound a programme!

POINTS FOR PIG CLUB MEMBERS.

In an informative address recently on matters of interest to junior farmers and particularly to members of School Pig Clubs, Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising in the Department of Agriculture and Stock, Brisbane, stressed the fact that the Home Project scheme and all schemes of practical training for junior farmers aimed not only at creating additional interest and giving club members something special to think about, but aimed at emphasising the value of the open air system of stock raising nowadays so popular in every part of Australia. Stock should be kept out in the open as much as possible, he said, and we should strictly avoid keeping pigs in small, dark, and damp pens, or in enclosures where they had no opportunity for exercise or grazing on succulent pastures. Pigs were kept for profit making and for nothing else, and unless the system under which they were kept resulted in profit, the business was not worth while and should be left alone.

The pig had for generations borne the good name of being a rent-payer and a profit maker, and had been spoken of as "the hog that made Chicago," the "housewife's most wholesome sink," the "husbandman's best scavenger," and so on. The scheme aimed also at teaching lessons in co-operation, thus in combined clubs or in district clubs all that was best in the scheme and in the members was brought out. The club scheme had already been responsible for several very useful off-shoots, of which the Farm Boys' Camps at leading State Royal and Royal National Shows was a special feature. It was hoped in days to come that special schools of instruction would be held, at which club members would attend as representatives of their own schools and districts. To these outdoor schemes there must be added the advantage of indoor study and the development of an inquiring mind.

Every club member should have the ambition to be the best it is possible to be and to excel, no matter what the course of work undertaken.

We must be progressive in order to become proficient and efficient. The 4H Club motto of America was well worth bearing in mind. The four H's—

The Head to Plan.

The Hands to Carry out the work.

The Health to continue on with such progressive work, and

The Heart to stand up to both the success and disappointments associated with life on the land.

To be successful we must work hard, think hard, aim high, and hit high.

A scheme for the formation of senior clubs for boys and girls who had already left school should be quite possible, and could be organised in co-operation with the junior clubs already in operation. Pig club members are already eligible to attend the Schools of Instruction arranged at Agricultural Colleges, and recently a club member from the Gilston State School, Queensland, attended the School of Instruction to Pig Farmers held at Gatton College.

Items well worth consideration and productive of a good material for discussions at club meetings included the productive powers of farm stock, the profit there was in pig raising, the beneficial results of co-operation, the suitability of the district for agricultural operations, the value of hygiene, the extension of operations, lessons on feeding and care of animals, and so on.

There can be no doubt but that pig raising is a very profitable and lucrative undertaking, but it is well worth while discussing the disadvantages or drawbacks just as well as the advantages and profits.

There are many useful and informative pamphlets on agricultural subjects available for free distribution at the Agricultural Department in the several States, and school committees and club members should aim at securing and studying copies of these.

PARTS OF A COW.

Contributed by CHAS. F. MCGRATH, Supervisor of Dairying.

The following diagram illustrates the various parts of a cow. It is necessary that you should make yourself thoroughly conversant with the names of the various parts before learning how to judge dairy cattle.

There are only two parts which require any explanation, viz., milk veins and the escutcheon.

Milk Veins.

The milk veins can be noticed and felt on and extending from the front of the udder along the underside of the body towards the forelegs. Of course these veins do not carry milk. The glands in the udder convert part of the blood into milk and so it follows that a large milk supply from a cow generally shows that it has a large blood supply, which in turn indicates that it must have large arteries and veins to carry that blood supply.

The milk veins carry the blood back to the heart and then to the lungs for purification. Where these veins enter the body will be found fairly large openings which are known as milk wells, which vary in size according to the size of the milk veins. Consequently, large tortuous and branching milk veins leading to large open milk wells are generally regarded as good points in a dairy cow.

Escutcheon.

This term, when applied to cattle, refers to the skin on the back portion of the cow extending upwards from the udder, on which the hair grows in an ascending instead of a descending direction.

The area and shape of the skin on which the hair grows in an ascending direction varies with different cows, and it was discovered by a Frenchman named Guenon that invariably different styles of escutcheons indicated the milk-producing capacity of the cow. Names have been given to these different styles, but as they are numerous it is not proposed to enumerate them here. Sometimes in the escutcheon small portions of the hair turn downwards. These are termed "feathers" although the term is used to cover any variation in the hair on or about the escutcheon. These feathers are of different shapes and are found in different positions on the escutcheon.

As a general rule the presence of "feathers" is not regarded as a good sign.

The escutcheon should be large and well defined.

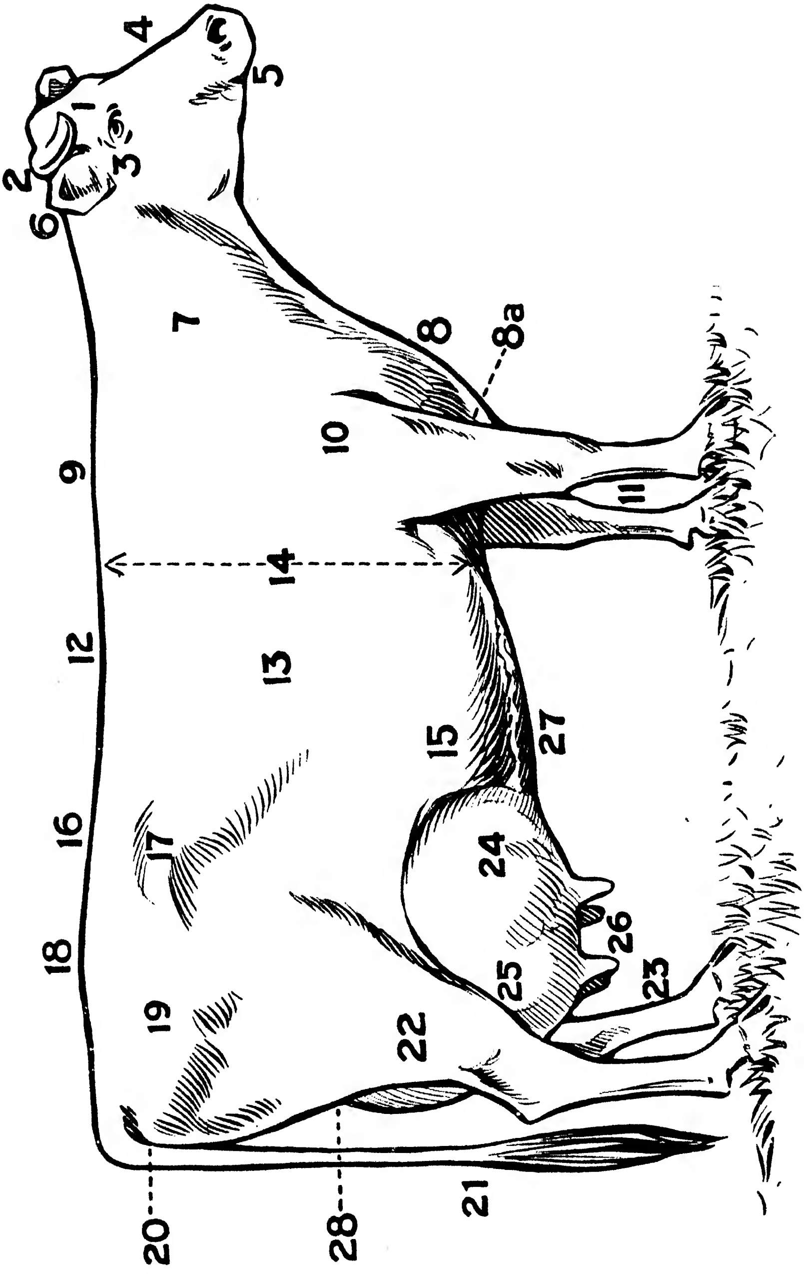


PLATE 45.—STANDARD MODEL DAIRY COW.

1 Forehead
2 Horns
3 Eyes
4 Face
5 Muzzle
6 Ears
7 Neck
8 Chest
8a Brisket
9 Withers
10 Shoulders
11 Forelegs
12 Backbone
13 Barrel or Body
14 Heart Girth
15 Belly
16 Loin
17 Hips
18 Pelvic Arch
19 Rump
20 Pinbone
21 Tail
22 Thigh
23 Hind Legs
24 Fore Udder
25 Hind Udder
26 Teats
27 Milk Veins
28 Escutcheon

POINTS OF A TYPICAL DAIRY COW.

(Irrespective of Breed.)

FOR THE USE OF JUVENILE CLUBS.

Scale of Points.	Maximum Points.			Judge's Points.
General Appearance.				
Constitutional Vigour : As shown by heart room, apparent health, strength, activity and general appearance ..		5		
Form : Wedge-shaped, as viewed from front, side and top (additional to points given in detailed section) ..		3		
Quality : Hair fine and skin soft, medium thickness, loose, mellow, and unctuous with yellow secretion		6	19	
Temperament : Active and nervous (but not "wild"), indicated by movement, eyes and lean appearance ..		2		
Colour		3		
Head, Neck, and Throat.				
Forehead : Broad and full				
Horns : Fine and of medium size				
Eyes : Large, bright, and yet placid				
Face : Lean, medium length, straight or slightly dished..			8	
Muzzle : Clean and strong, mouth and nostrils large ..				
Ears : Medium size, fine in texture, yellow pigment inside				
Neck : Rather long and thin, fine, clean throat and dewlap				
Fore-quarters.				
Chest : Broad and deep				
Brisket : Lean and not fleshy				
Withers : Well defined, and not coarse at point of shoulders			5	
Shoulders : Light, sloping, not too fleshy and oblique ..				
Legs : Straight, rather short, and not too large or coarse..				
Body.				
Backbone : Well-defined, lean, open-jointed and level ..		3		
Barrel or Body : Long and large, ribs broad, well arched, open, and set wide at finish ; a large strong body in proportion to size			21	
Heart Girth : Large and deep, abundant room for active heart and lungs	18			
Belly : Large, broad and deep, with a large and strong navel				
Loin : Broad and strong				
Hind-quarters.				
Hips : Wide apart, lean and refined				
Pelvic Arch : Prominent and strong	6			
Rump : Long and wide, with pin bones wide apart and well defined				
Tail : Long, fine, with good switch and neatly set on ..	2		16	
Thighs : Long and lean, flat inside and out, no beefiness, thin arched flanks				
Legs : Rather short, wide apart and not coarse ; placed squarely under the body	8			
Udder.				
Fore Udder : Full, broad and extending well forward, not fleshy				
Hind Udder : Broad, full and attached high, not fleshy ; plenty of loose skin ; with a silky touch, without pronounced quartering	18			
Teats : Of good size and form, evenly placed, and hanging perpendicularly, texture soft	5		31	
Milk Veins : Upon the udder and in front of it, prominent, large and tortuous, leading to large open milk wells ..	5			
Escutcheon : Good of its kind	3			
Grand Total	100			

RECOGNISED COLOURS FOR HERD BOOK REGISTRATION.

I.M. Shorthorns.

Red (dark and light), red and white, roan, roan and white, strawberry roan, strawberry roan and white, and white.

Note.—Muzzle must be free from smuttiness, udder should not be quartered.

Teats should be brown in colour.

Jersey.

Whole colour varying from fawn to almost black with orange markings on the back and middle piece, or broken colours.

Note.—Muzzle should be encircled by a light colour. Horns should be small and incurving. Yellow colour on horns, escutcheon and inside of ears indicating richness.

Clipped or shaved animals not recommended.

Ayrshire.

Red of any shade, brown or white, or a mixture of each colour being distinctly defined.

Note.—Long horns generally characterise the breed.

Friesian.

Black and white patches, each colour being distinctly defined. The following colours are not allowed and would bar registration in the Herd Book:—

(1) All black or all white or red and white.
(2) Black switch.
(3) Solid black with white on belly only.
(4) Black on legs, beginning at feet and extending to knees and hocks, or with white generally prevailing.
(5) Grey or mixed black and white, generally interspersed.
(6) Patches of colours other than black and white.

Guernsey.

Light yellow, brown, or fawn, with a flesh coloured muzzle, and with patches of white.

Note.—The horns turn upwards while the face is not "dished" like the Jersey.

HOW TO JUDGE DAIRY CATTLE.

In judging a dairy cow the first essential is to view the general outline of cow. This can be best done from a distance of ten or fifteen yards.

Side View.

The cow should be "close to the ground"—that is, its body should be fairly low and not "leggy."

The body should be wedge shaped—that is, deep at the hind legs and narrower towards the fore legs.

Front and Back View.

When viewed from the front the wedge shape should be apparent. The well-sprung rib should contrast with the comparatively narrow forepart. A close inspection of the animal should now be made.

Udder.

If the cow is in full milk the udder, viewed from the back, should be wide and run well up towards the tail. Feel the udder. It should be elastic—soft and silky with an oily feel.

The udder, viewed from the side, should run well out under the belly and be held up close to the body for preference. Teats should be of medium length and not bottle shaped. They should be spaced evenly on the udder and should be of a dark colour for preference.

Milk Veins.

Run your hand along them. They should be large, and tortuous and extend well forward.

Skin.

The skin should be felt behind the last rib. It should be soft and elastic. A thick hard skin is a bad sign.

Escutcheon.

This should be of a comparatively large area.

Head.

The cow should have a good breadth between the horns, a well carved head, full, bright eyes, well developed nostrils, and a strong mouth with even jaws (not pig-jawed).

Neck.

The neck should be of good length, fine about the shoulder, and not baggy about the throat.

Back.

The back should be level from neck to tail, the backbone being well defined.

Tail.

The tail should drop perpendicularly and should be of good length, ending in a good brush. A short thick tail is a bad feature.

Hindquarters.

Should continue wide back to the pin bones. The thighs should be long and flat inside and outside, and from a side view should curve slightly forward.

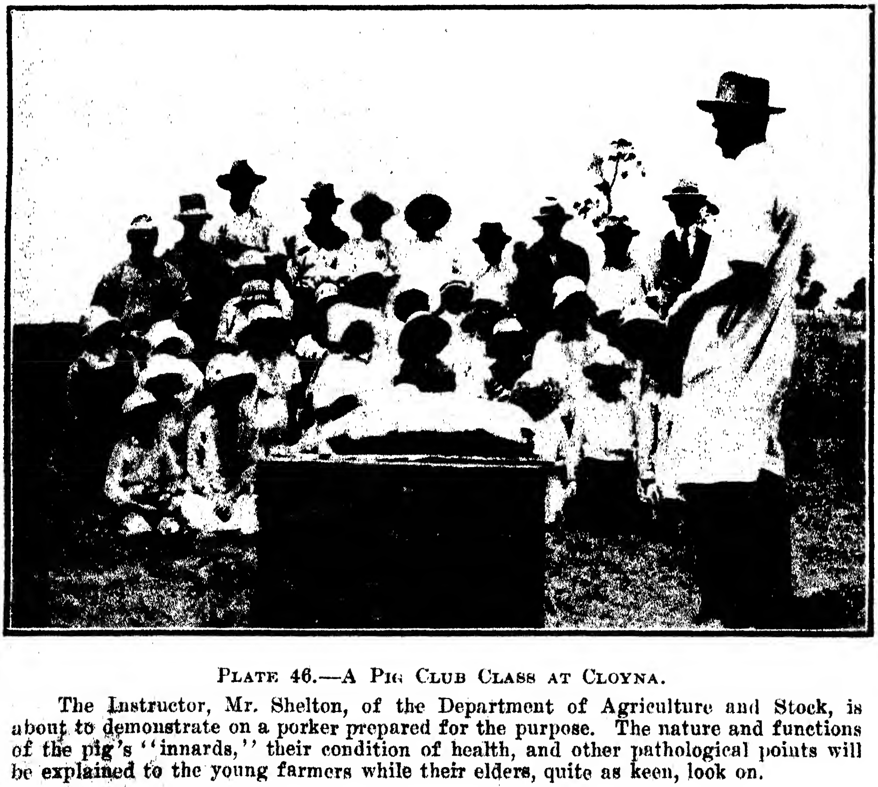


PLATE 46.—A PIG CLUB CLASS AT CLOYNA.

The Instructor, Mr. Shelton, of the Department of Agriculture and Stock, is about to demonstrate on a porker prepared for the purpose. The nature and functions of the pig's "innards," their condition of health, and other pathological points will be explained to the young farmers while their elders, quite as keen, look on.

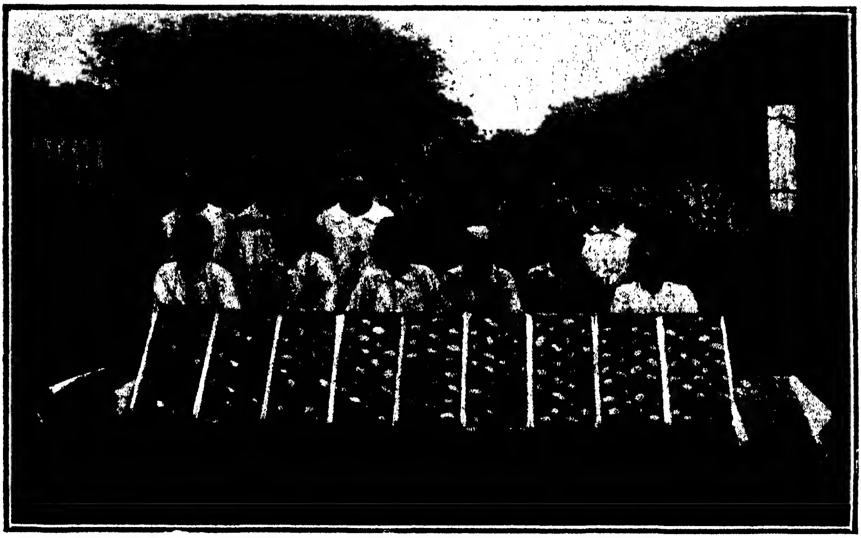


PLATE 47.—JUNIOR FRUIT PACKERS PLEASED WITH THEIR JOB.

In conjunction with the Department of Public Instruction the Department of Agriculture and Stock conducts fruit packing classes for school children. This picture was taken at Thornlands on the orchard of Mr. A. F. Smith, who supplied the fruit and other facilities for the success of the class. Each lesson lasts an hour, and these cases were packed by the young farmers in their second lesson. The children, under the leadership of their head teacher, Mr. Fraser, display great eagerness and keen intelligence in their club work.

PIG CONFERENCE IN THE WEST.

To invite discussion of the various problems and to get together to discuss the position, the West Australian Minister for Agriculture recently called a conference of parties interested, including representatives of the factory organisations, the distributors, the producers, and departmental officers. As a result, certain definite decisions were arrived at, and it was unanimously agreed that the type, conformation, and general quality of carcasses which meet the requirements of the bacon curers also meet those of the pork trade, and vice versâ. This discussion is of outstanding importance, as it is often assumed that different breeds or crosses are required to produce animals best suited to the pork and bacon markets respectively. A standard was set up for carcasses for pork or bacon in West Australia to which attention of all pig raisers is to be directed.

The type of carcass required in West Australia does not materially differ from that required in the Eastern States of Australia, but it is of interest to know that a definite breeding policy has been decided upon, and it has been unanimously agreed that for West Australia conditions a combination of the Berkshire and Tamworth breeds yielded the best bacon pig and also an excellent porker. The ideal pig would be obtained by the production of the breeding sow from mating purebred Berkshires with purebred Tamworths and mating the sows from the cross-breed to a purebred (unrelated) Berkshire boar. This is known as the "Berkshire-Tamworth comeback."

In grade herds of various breeds the purebred selected Berkshire boar is recommended for grading up and the production of bacon pigs. In order to produce standardisation within the pig industry, great importance is attached to the selection by the farmer of a suitable breed or cross, which principle is considered the foundation of the trade. The above recommendation has been based on purely commercial considerations; and concentration on two breeds or crosses, which supply the demands of the market, is undoubtedly preferable to diversity.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Broad-leaf Carpet Grass.

H.H. (Landsborough)—

Your specimen is *Paspalum platycaule*, the Broad-leaf Carpet Grass, a native of tropical America now widely spread over the tropical and sub-tropical parts of the world. It is very abundant in North Queensland, and of late years has come further south and is now quite common along several places on the North Coast Line between here and Gympie. It is not generally regarded as of a particularly high fodder value, but is useful for growing in poorer lands where ordinary paspalum will not thrive. A rather better strain from a fodder point of view is the narrow-leaf form sold in Australia under the name of *Axonopus compressus.*

Hare's Ear Mustard.

J. H. McC. (Dalby)—

The specimen is Hare's Ear Mustard, *Conringia orientalis,* a very common European and American weed now found naturalised throughout the more temperate parts of the world. It belongs to the Mustard or Cabbage family and the local name arose from the shape of the leaves being somewhat like that of a rabbit's ear. Beyond being a weed in cultivation it is not known to possess any harmful qualities.

Scrub Panicum.

A.J.G. (Duleen)—

The specimen is *Setaria macrostachya*, a native grass generally known as Scrub Panicum. It is not particularly common in any one locality, though it is fairly widely spread over Queensland, and is generally regarded as a rather coarse fodder. It is easily propagated from seeds, but it is not so succulent and has no particular advantage over other species of Setaria commonly cultivated under the name of Panicum, Hungarian Millet, &c.

Jack Bean *(Canavalia ensiformis).*

N.D. (Beaudesert)—

The bean is a species of Canavalia, but these are rather hard to tell in the young stage. It is, however, we should say, *Canavalia ensiformis*, the Jack Bean, characterised by having large white seeds.

The bean may be used sliced as much in the same way as ordinary French beans in the young stage, or the nearly ripened seeds can be boiled and eaten in the same way as ordinary broad beans. It is as well to be cautious when using them as they do not agree with all stomachs, though we have used them at various times and found them quite good eating.

Another variety, *Canavalia gladiata,* is commonly grown here. It has large red seeds and is not generally considered so good as the white-seeded variety.

Buffel Grass.

M.A.V.B. (Alice Springs, Central Australia)—

The specimen is *Pennisetum cenchroides,* the Buffel Grass. We are very interested to learn that the grass is growing in Central Australia, as the only other place we knew of it growing in Australia in any quantity at all is in the north-western parts of Western Australia, where it was introduced from India about fifteen years ago. The manager of Dalgety's branch at Port Headland stated that it makes a tender sweet growth liked by all classes of stock, and in addition makes excellent hay, and in a good season grows from 18 to 24 inches high. Thinking the seeds might be injurious to wool we got in touch with Mr. MacKenzie, of Dalgety's, at

Port Hedland branch, and he replied as follows:—"It is quite harmless to wool. It thrives here in purely cattle and sheep country, and does not affect the wool in any way."

The grass has, we understand, within the last couple of years been introduced into one or two places in Queensland, but we have not seen it growing here as yet.

Red Clover. Bougainvillea.

W.A.E.C. (Tamaree)—

Your specimen is Red Clover, *Trifolium pratense*. This is very interesting, as the Red Clover is not generally regarded as suitable for Queensland conditions, as it is inclined to die out with our hot summer weather.

Bougainvilleas.—There are several coloured variations, and the following are the best four now generally listed by nurserymen:—

Bougainvillea glabra var. *Sanderiana* or *Bougainvillea Sanderiana*, magenta coloured; *Bougainvillea lateritia*, the brick-red Bougainvillea; *Bougainvillea magnifica*, a bright purple of which a variety, var. *Araillii*, is listed as an improved form; and *Bougainvillea rosea* (also known as *Bougainvillea Thomasi*), deep pink. This last is generally regarded as one of the best, and plants are a little more expensive than the other varieties. The best time for planting is either spring or early summer.

Rattle Pod *(Crotalaria incana).*

J.C.H. (Jackson)—

The specimen, taken from an old cotton patch, is *Crotalaria incana*, a species of Rattle Pod. The genus Crotalaria is a large one, widely spread over the warmer parts of the world, the species being generally known as Rattle Pods or Rattle Boxes due to the rattling noise the seeds make in the dry pods. They are generally regarded as poisonous or harmful to stock and, mostly, stock avoid them. The plant you forward has come under suspicion at various times, though nothing definite has been proved against it. In view, however, of the poisonous nature of other members of the same group of plants it is as well to destroy it from paddocks where it makes its appearance.

Fuchsia Bush.

J. H. McC (Dalby)—

The specimen of fuchsia bush from the Dalby district represents *Eremophila maculata*. The specimen was also handed to the Agricultural Chemist, Mr. J. C. Brünnich, and the following is a copy of his analysis:—

		Lab. No. 2792 Fuchsia Bush.	Lab. No. 2996, Fuchsia Bush.
		Per cent.	Per cent
Moisture		8·4	12·1
Analysis of Waterfree Material	Protein	18·0	12·4
	Carbohydrates	56·4	46·1
	Fat	0·7	1·1
	Fibre	14·4	32·4
	Ash	10·5	8·0
	Lime	1·491	·943
	Phosphoric Acid	·544	·216

The first sample had a very fair fodder value, but the second sample is very poor for a shrub and very indigestible on account of high fibre content. It is quite possible that this plant has a severe effect on worms, as it is highly poisonous, and according to latest researches a little less than 1 oz. of the air-dried leaves will kill a sheep in about forty minutes. It would be a great mistake to rely on this plant as a worm remedy, and it should be eradicated wherever found to avoid disastrous results, which might happen at any time.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Cotton Seed a Risky Pig Food.

N.D.M. (Coominya)—

The Agricultural Chemist, Mr. J. C. Brünnich, states that the feeding of cotton seed to pigs is always risky, and that it is not a suitable food for breeding sows. As you have some separated milk and lucerne available, we would recommend maize grain and meat meal to complete the ration. With plenty of milk and lucerne you only require maize to balance the ration, but when skim milk is scarce the addition of meat meal will make up for the protein matter which is usually supplied in the milk. Lucerne should be used as fully as possible both as grazing and by adding lucerne chaff or dust to the skim milk. When milk is not available, the pigs will do well if grazed on lucerne and fed a ration made up of maize 80 lb., meat meal 10 lb., and lucerne dust or good leafy chaff 10 lb. If milk is used the meat meal can be reduced to about 3 lb. in every 100 lb.

Housing the Breeding Sow.

A beginner in the pig business recently asked a number of important questions having reference to his desire to gain up-to-date knowledge in regard to a number of details on which it was apparent there was a diversity of opinion. Among other queries the following were submitted:—

Question.—Would it be necessary to provide both sleeping and farrowing sties? I am told it is better to allow the sows to go away into the bush and farrow on their own and bring the young ones home when they are ready.

Answer.—The provision of suitable housing both for farrowing sows and for other pigs is strongly recommended. It is not argued that a sow that farrows in the bush will not produce a good litter; but on the average, the losses are about 50 per cent. higher than where the sows are properly cared for in sties. The pig sties need not be expensive buildings nor need they be elaborate, but sties are an absolute necessity just as are fences and feeding troughs. With regard to the number of sties that are required for fifty sows, at least twenty sties arranged for farrowing should be provided. Portable shelter sheds that can be moved from place to place in the paddocks where the pigs graze can be used for housing the paddock pigs. The central farrowing house is a necessity on a pig farm where there are sufficient sows to warrant the expense. This farrowing house would be a series of up to twenty or more pens adjacent to one another, and it is thought for preference, if the ground available permits, it is better to arrange these under one roof with a central passage-way and feeding troughs on either side, the pens to be approximately 10 feet wide by 8 feet deep, or at outside, 10 by 10, with feeding troughs in the same compartment as the sleeping floor if the style of building decided on permits of this. This would necessitate concrete or brick and cement floors both for the feeding area and the sleeping place, the latter to have a hardwood floor affixed on top of the concrete to obviate the necessity for the sow sleeping on the stone floor, the latter being objectionable and liable to lead to trouble from rheumatism.

It is admitted opinions vary on these questions, for some breeders prefer to have a long straight line of pens with the sleeping accommodation under cover at the back of the pens, and the front portion open (but securely fenced) to permit of the feeding trough being in the open exposed to sunlight, the feeding to be done either through a spout in the end of the trough which would project slightly beyond the sty, or by means of a swing-door opening into the trough. In both cases it is a decided advantage, even a necessity, to have good exercise yards attached to each sty so that the pigs can live out as much as is possible while compelled to remain in confinement with their young litters. In both systems a set of rails and a feeding trolley would be an advantage, and where the number of pigs to be fed warrants this it should be attended to. If this is not possible a feeding barrow of sufficient size to carry the feed required should be provided, or a less expensive arrangement—a barrel or two on a slide drawn by a horse, would suffice. The sow and litter should be transferred to the open runs again after the boar pigs are castrated (at six weeks of age) and the litter is approaching weaning age, but, if possible, no more than one or two sows and litters should feed together, as it is a mistake to have a number of sows and litters running in the one yard.

Under the American system the sows are kept in yards or small paddocks up to one-quarter of an acre or less in size, and each yard has an individual farrowing house which acts as sleeping quarters. The feeding troughs are then placed right away from the house, and the feed is carried by slide and barrel or by some other system of a labour-saving nature.

It is, generally speaking, a mistake to allow sows to go away into the bush and farrow without any attention at all, though even under this system some breeders report successful results. The housing of the breeding sow is a subject worth the closest study.

Costs in Pig Raising.

Question.—When growing pig feed, does one deduct from the price of the pigs sold, the market value of the food produced, or only the actual cost of producing the food; that is, if it costs me 2s. 6d. to produce one bushel of corn, and corn was worth 4s. 6d. per bushel, would I deduct 4s. 6d. from the price of my sale pigs or only 2s. 6d.?

Answer.—To ascertain the actual profit resulting from the sale of any line of pigs, one must not only deduct the cost of food, but also of labour, cartage, and incidental charges generally. It is usual to deduct the actual value of the food produced only. Of course, by actual value in this case is meant the value of the crop, as it is in the form in which it is fed to the pigs. Take corn, for instance. Corn-growing or ripening in the paddock cannot possibly be valued at the same price as that which is sold in the market; it costs something in the first instance to plough the ground, harrow, drill, sow, cultivate, and produce the crop to the stage at which it is ready for pulling. Then it costs somehing more to pull the corn, husk and shell it, clean, bag, and place it on the market; the latter charge will be proportionately higher than the former; hence, in charging up the value of the corn as a pig food you would value it at its actual cost to you on the farm. It is difficult to say how much a bushel of corn costs to produce, but it certainly is not worth 4s. 6d. per bushel (or its market value) until it is in the bags and on the market. It would not be fair to charge up the cost of the corn to the pigs at the market price you receive for it after you have gone to the expense of husking, shelling, cleaning, bagging, carting, railing, or shipping, and selling it at auction in the market. The pigs can do the husking, shelling, &c. The same may be said of any other crop; you would charge up its actual value on the farm, not its value on the city or other markets.

The whole question of costs of production is an important one, and one that needs very close attention if the farmer is to work on anything like up-to-date lines. The old rule-of-thumb methods do not pass nowadays, for we must keep some records or we cannot correctly make the allowable deductions in making up our income tax papers, or in giving details of cost of production. It is a good idea to keep a record of the market value of any foods used and to endeavour to figure out the additional profit resultant from utilisation on the farm of the crop or foods produced thereon. The farmer is not however usually inclined in the direction of accountancy, but it adds considerable interest to the business if we know exactly or approximately how we stand financially.

Arsenic Pentoxide as a Spray. Grenadilla. Banana Suckers.

V.T. (Djarowong, Feluga, N.Q.)—

1. *Spraying of Grass with Arsenic Pentoxide.*—The Director of Agriculture advises that a test of this character has not been carried out. However, as this chemical is a very potent plant poison it may have an effect on partly matured seed. The better plan would be to burn off the dried grass after it has been sprayed. Another substance suitable for weed and grass destruction is Sodium Chlorate. Information on and supplies of the poison may be had on application to A. C. F. and Shirleys Fertilisers Ltd., Little Roma street, Brisbane.
2. The Agricultural Chemist, Mr. J. C. Brünnich, advises that nothing is known about the vitamine content of the grenadilla. Like all fruits, it is bound to contain some.
3. The Director of Fruit Culture, Mr. Geo. Williams, advises that a banana sucker cut close back should have the centre "scored" out and a shoot allowed to develop from the side. It will then throw a better bunch than if not cut back at all.

General Notes.

Staff Changes and Appointments.

Messrs. F. C. Robinson and R. A. Ulcoq, of Gayndah, have been appointed Honorary Inspectors under and for the purposes of "*The Diseases in Plants Act of* 1929."

The Officer in Charge of Police at Cardwell has been appointed an Acting Inspector of Stock and also an Inspector of Brands.

Mr. C. Mitchell, Health Inspector, Townsville, and Mr. W. Austin, Health Inspector, Mackay, have been appointed Inspectors under and for the purposes of "*The Dairy Produce Act of* 1920."

Mr. W. Cottrell-Dormer has been appointed Assistant Pathologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, as from 1st April, 1930.

The services of Mr. P. J. Short, Temporary Inspector of Slaughter-houses, Warwick, have been continued from 1st May to 30th June, 1930; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 18th May to 14th June, 1930.

The appointment of Acting Sergeant D. J. Gavin as Acting Inspector of Stock has been cancelled, and, in lieu, the Officer in Charge of Police at Bell has been appointed an Acting Inspector of Stock. Mr. E. C. Dunn, Inspector of Stock, Kingaroy, has been appointed also an Inspector of Brands; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 15th to 30th June, 1930.

The following have been appointed cane testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Marles (Babinda), Mr. T. P. Brown (Bingera), J. G. D. Casey (Cattle Creek), T. D. Cullen (Fairymead), Miss F. Parkinson (Farleigh), Miss E. Christsen (Gin Gin), G. R. Jorgensen (Inkerman), Miss M. T. Smith (Invicta), Miss J. O'Flynn (Isis), W. Ahern (Kalamia), W. Richardson (Marian), Miss A. L. Levy (Maryborough), C. J. Boast (Millaquin), Miss I. Palmer (Moreton), V. F. Worthington (Mossman), F. H. Compton (Mount Bauple), Miss N. Walsh (Mourilyan), H. Jensen (Mulgrave), Miss J. Orr (North Eton), T. Breen (Pioneer), L. G. F. Helbach (Plane Creek), W. J. Mason (Pleystowe), L. Chadwick (Proserpine), Mrs. K. Dunton (Qunaba), L. G. Home (Racecourse), J. Howard (Rocky Point), T. Herbert (South Johnstone), and F. Jorss (Tully).

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills mentioned:—Miss A. Mullin (Babinda), Miss M. A. Morris (Bingera), G. Tait (Farleigh), Miss G. Dingle (Inkerman), Miss C. Humphreys (Invicta), G. Fanning (Kalamia), D. Walton (Marian), Miss N. C. Whittle (Marian), Miss A. Murray (Maryborough), Miss D. Bowder (Millaquin), Miss M. A. Lyle (Moreton), Miss T. Payne (North Eton), H. Whitcher (Pioneer), Miss M. Orr (Plane Creek), Miss E. Rowe (Plane Creek), H. Humphreys (Pleystowe), Miss O. Knight (Pleystowe), Mrs. M. Nally (Proserpine), and T. F. Corbett (Tully).

The transfers of the following District Inspectors of Stock have been approved:—W. N. Holmes, from Warwick to Townsville; J. J. Ashe, from Townsville to Mareeba; and E. C. Lake, from Mareeba to Warwick. Mr. J. Gunne, Inspector of Stock, Boonah, has been transferred to Gladstone, and Mr. J. P. Dowling, Inspector of Stock, Warwick, has been transferred to Clermont. Mr. J. C. Pryde has been appointed a Temporary Inspector of Stock and Slaughter-houses at Gympie. Mr. W. O. Hynes, of Godfrey street, Toowoomba, has been appointed an officer under the Animals and Birds Acts.

The Officers in Charge of Police at the following places have been appointed Inspectors of Brands:—Biggenden, Eidsvold, Gayndah, Gin Gin, Goomeri, Howard, Imbil, Kilkivan, Kumbia, Monto, Mount Perry, Mundubbera, Murgon, Proston, Rosedale, and Tiaro.

Commodity Boards—Government Representation.

The constitutions of the Arrowroot, Cotton, Atherton Maize, Barley, Honey, Canary Seed, and Butter Boards have, till the present time, provided that those boards shall consist of a certain number of elected representatives of the growers of the particular commodity and the Director of Marketing. The constitutions of these boards have now been amended to allow of a deputy appointed by the Minister representing the Minister on the boards in case of the absence of the Director of Marketing.

Inkerman Mill—Levy Transfer.

As the result of a levy made on the Inkerman mill suppliers during 1929, in order to defray expenses in connection with the farmers loading sugar at Townsville during the Waterside Workers' strike in 1928, a balance of about £80 was left after the payment of expenses. An amendment has been approved to Regulation 210 (which gave the mill suppliers' committee power to impose the levy) whereby this balance may be transferred to the administrative fund of the committee, thus making the levies for this year for administrative purposes so much lighter.

Cheese Board.

An Order in Council has been approved giving notice of the intention of the Governor in Council to issue an Order in Council extending the operations of the Cheese Board for a period of three years as from 1st August, 1930. It is also declared that the Governor in Council will receive, on or before the thirtieth day of June, 1930, a petition signed by not less than 10 per cent. of the growers of cheese requesting that a vote of such growers be taken on the question as to whether the functions of the Cheese Board shall cease on 31st July, 1930, or continue until 31st July, 1933. Growers eligible to vote will be persons who, at any time within the six months immediately prior to the election, supplied or supply milk to cheese manufacturers in Queensland.

Entomological Branch—Mr. Veitch's Tour Abroad.

The Secretary for Agriculture (Mr. H. F. Walker) announced recently that Mr. R. Veitch, the Chief Entomologist and Vegetable Pathologist for his Department, had left by the R.M.S. "Maloja" for England.

Although Mr. Veitch is really going on a holiday tour, Mr. Walker has commissioned him to visit the chief entomological and vegetable pathological institutions in Great Britain with the object of acquiring any information that would be useful to his Department. At the same time, he would make inquiries into the possibilities of securing a suitable Pathologist who would be able to undertake the work in Queensland in connection with the disease of pineapples. This matter had recently been brought under Mr. Walker's notice by the Pineapple Sectional Group Committee.

Mr. Veitch would also inquire into the practicability of obtaining in Great Britain the services of an Entomologist who would devote his time to the entomological problems, particularly the corn ear worm, connected with cotton-growing in Queensland.

Cattle of the Future—Significant Facts.

From the Red Poll Cattle Society:—Significant facts with regard to the future of the cattle-breeding industry in most parts of the world are to be seen in the growing attention that is being bestowed in the breeding of dual-purpose stock. Evidently the warning note sounded by those in a position to judge of the future, that a beef shortage is imminent, has had not a little to do with the remarkable demand that has sprung up not only in Great Britain for dual-purpose cattle but of the widespread trade experienced for the dual-purpose Red Poll bull overseas. This British breed, which enjoys a considerable reputation for hardiness, has, in the last two years, met with its biggest export demand in its long history.

The remarkable trade for sires grows apace. While they have gone to North and South America, and have also been imported into Australia in the last twelve months, the extraordinary demand with South Africa, East Africa, and South-west Africa continues unabated. It is explainable when, according to the statement of a big ranch owner in one of the driest parts of South Africa, the Red Poll has proved a type of cattle desirable for semi-tropical countries because of its strong constitution and ability to produce butter and beef. The same farmer states that experience has shown him that the Red Poll has best served his purposes for cross breeding, and he emphasises the value of a dual-purpose breed owing to what, as he says, has proved the unwise policy of having bred for the pail, thereby leading to the production of far too many long-legged animals of poor constitution.

So far this year the exports of Red Polls have been to Kenya Colony whither a fresh contingent are on the way, Southern Rhodesia, Victoria (Australia), the Argentine, Queensland (Australia), and Brazil. The continuance of this trade for Red Polls for both pure and cross breeding, while being not a little due to the dual-purpose characteristics, is the outcome of a decided tendency for cattle breeders to have two strings to their bow, by producing milk and beef from one and the same breed.

Cotton Board.

An Order in Council has been passed amending the Primary Producers' Organisation and Marketing Acts so that now the Cotton Board shall not take cognisance of nor be compellable to pay any order given by a cotton grower to pay to any person, except the Crown or itself, any portion of the moneys due to such grower on account of seed cotton by the Board. This means that, in future, the Cotton Board need not recognise any orders given by cotton growers to tradespeople or others on account of any moneys due to them by the Cotton Board for seed cotton.

The Fruit and Vegetables Act.

The grade standards in use at present for Cavendish bananas ("Special," "Choice," "Standard," and "Plain") have been rescinded, and a regulation has been passed under the above Act substituting new standards therefor. These new standards are "Sixes," "Sevens," "Eights," and "Nines," and the measurements are as follows:—

Sixes—5½ to 6½ in. in length, by 4 in. in circumference;

Sevens—6½ to 7½ in. in length, by 4 in. in circumference;

Eights—7½ to 8½ in. in length, by 4¼ in. in circumference;

Nines—8½ in. and over in length, by 4¾ in. in circumference.

All measurements for length are to be taken on the outside of the curve from the junction of the fruit at the stem end to the apex of the fruit.

Returns by Honey Merchants.

Regulations 246 and 247 under the Primary Producers' Organisation and Marketing Acts have been approved. These regulations provide that, for the purpose of collecting statistics for the use of the Honey Board, all wholesale merchants for the sale of honey must furnish to the Minister, on or before the 14th June, 1930, returns in respect of the twelve months from the 1st May, 1929, to the 30th April, 1930, as follows:—

(1) The total quantity of honey (in lb.) purchased during the period, showing the quantity purchased direct from growers, quantity purchased from commission agents, and any purchases from other States, naming the States.

(2) Stock of honey on hand at 30th April, 1930, and the proportions of which are Queensland honey and Interstate honey.

(3) Stock of honey on hand at 30th April, 1929.

(4) Wholesaler to state whether he has a blending and bottling plant in use on his premises, and, if so, what type and capacity.

(5) Signature and address.

Any person who commits a breach of the above regulation shall be guilty of an offence, and be liable to a penalty not exceeding five pounds.

Farm Life—Influence of the Motor.

It is doubtful if there is any other class of the community whose life has been so much affected by the motor vehicle as the man on the land. The farmer to-day is in touch with all the advantages of urban life, without certain of the drawbacks that living in a city undoubtedly has. The cultural advantages that are made possible by massed population are open to the farmer and his family by means of motor transportation on just as easy terms as they are available for residents of the city. The isolation, which used to be a burdensome characteristic of farm life, has been removed by the introduction of the motor vehicle. but even this contribution to the pleasure of rural life is not the most important factor in the benefit given to the farmer by motor transportation.

On the practical, utilitarian side the contribution is even greater. By means of motor transport vehicles the hauling time for farm products has been cut probably to a quarter of what it used to be. This means that the farmer's labour bill to-day can be devoted principally to productive effort on the land, instead of being to a considerable part a payment for the necessary but unproductive work of carting. Where years ago a man's whole day, and perhaps many days together, was needed for carting produce to market or railway a quarter of that time now suffices and the rest is available for more productive work.

This item of hauling carries with it, of course, the benefits that have accrued to the farmer from the multiplication of good roads, which never would have come without the impetus given by the motor car.

Banana Growing in the Quarantine Area.

The Secretary for Agriculture and Stock, Mr. Harry F. Walker, announced recently that as promised at the meeting of banana growers held at Palmwoods on 12th June, he had conferred with the members of the Banana Protection Board (Messrs. K. R. Hack and A. E. Maher, representing the growers, and G. Williams, Director of Fruit Culture, and J. H. Simmonds, Plant Pathologist, Government Representatives), also Mr. W. Ranger, Manager of the Committee of Direction of Fruit Marketing, regarding the question of allowing planting in the recently proclaimed Bunchy Top Quarantine Area, and as a result of this conference it had been decided unanimously that permits in the quarantine area shall be issued subject strictly to the following restrictions, in addition to the general conditions laid down by the Board:—

1. No permit shall be granted to an applicant whose plantation at the date of application, either wholly or in part, is in a neglected condition or has at any time during the preceding six (6) months been known to be so and/or where such neglected condition has not been rectified without without pressure from an inspector.
2. No permit shall be issued in respect of any plantation in which Bunchy Top has appeared during the preceding four (4) months. Exemptions from this clause may be granted by the Board under special circumstances.
3. In general, permits shall not be issued for any area or areas which will bring the total acreage under bananas for any one owner or occupier in excess of eight (8) acres, unless by special permission of the Board.
4. Planting of new areas by persons not at present established in the district is undesirable, and permits for such planting will only be granted by the Board under very special circumstances.
5. Any plantation in which Bunchy Top is found discernible in the third leaf from the top of the plant shall be classed as a neglected plantation and dealt with as such.

Declaration of Banana Plants as a Pest in Metropolitan Fruit District.

A Proclamation has been issued proclaiming a Metropolitan Fruit District (No. 10 under the Diseases in Plants Act), and a second Proclamation has also been issued proclaiming that all plants of the Genus Nusa (including Bananas, Plantains, and Manila Hemp), but not including the fruit thereof, in such Metropolitan Fruit District, are pests under and for the purposes of "*The Diseases in Plants Act of 1929.*"

The boundaries of the Metropolitan Fruit District are defined as follows:—Commencing on the right bank of the Brisbane River at a point south from the south termination of Bunya street, Whinstanes, and bounded thence by a line and that street north to the Pinkenba Branch Railway, by that railway south-westerly to Mordant street, by that street north, by Hampden street west, by Nudgee road northerly to Blinsinger road, by that road north-westerly to Northgate road, by that road north-easterly to Tufnell road, by that road north-westerly to Downfall Creek, by that creek upwards to the Sandgate road, by that road north-westerly to Robinson road, by that road west to Railway parade, by that parade south-easterly to Geebung road, by that road south to Hamilton road, by that road west to Gympie road, by that road southerly to Stafford road, by that road westerly to South Pine road, by that road, Bell street, and Stewart road southerly to Waterworks road, by that road westerly to Orchard road, by that road, Barnett road, Simpson's road, Mount Coot-tha road, Dean street, Sherwood road, and Miskin street southerly to Stanley terrace, by that terrace westerly to Taringa parade, by that parade, Moggill road, Witton road, and Bridge street southerly and east to the Brisbane River, by the right bank of that river upwards to a point north from the northern termination of Fort road, by a line, that road, and a road in continuation south-easterly to Ipswich road, by that road and Rice street north-easterly and northerly to Hamilton road, by that road and Beaudesert, Mayfield, Toohey, Marshall, and Holland roads easterly and north-easterly to Cavendish road, by that road and Boundary road northerly to the Old Cleveland road, by that road easterly to Creek road, by that road, Murarrie, Queensport, and Lytton roads northerly to Bulimba Creek, by that creek downwards to the Brisbane River; and thence by the right bank thereof upwards to the point of commencement.

As a result of the foregoing it will now be necessary for all persons having bananas growing in the abovementioned area to take them out and destroy them. The object of the declaration is in connection with the campaign to prevent the spread of Bunchy Top in banana-growing areas. At the present time the growing of bananas in suburban gardens is a serious menace to the industry, and in the vast majority of cases these bananas serve no useful purpose.

Clothes of Australian Make.

Mention was made at the annual meeting of shareholders in Pike Brothers, Limited, Queen street, recently, of the great advance that has taken place in the making of Australian goods. Due to the company's effort to get manufacturers to make for them special quality goods, with exclusive features, it is now found necessary to import but a small percentage of stock, and that only in the really exclusive wares from world-renowned producers whose goods would ever be sought. It is estimated that about 87½ per cent. of the firm's stock is made in Australia, practically all ready-to-wear clothing; all shirts and pyjamas are made on the premises. Almost all their collars are now made in Australia, while the greater proportion of the hats, caps, underwear, boots, and leather goods are all purchased here, from those makers who were prepared to meet Pike's special demand for super-quality articles.

The Tell-tale Strainer.

Examination of milk samples for bacterial content proved conclusively that the cleansing of the cow's udder and the grooming of her body were absolute necessities. It would be a very progressive step if all and sundry regarded the milk strainer as a superfluous dairy appliance. After all, a strainer only arrests what really should not get in. Foreign matter that might find its way into the milk or portion of it might become soluble and pass through the strainer, constituting thereby a perfect nucleus for a rich bacterial content in very quick time. The gauze of the strainer is the dairy hand's tell-tale, and it is not edifying to see it bumped about before the milking has made much progress so that the flow of milk through its meshes might be imperfectly strained.

Care of Harness.

Harness perishes very quickly if neglected, but if reasonable care is exercised it will last for years. Plated harness should not be kept in the stables, as the gases arising from the decomposition of the excreta tarnish the fittings. Immediately the harness is brought in the dust should be carefully wiped off with a soft cloth or leather, and mud or sweat removed by washing with water, but on no account should too much be used. The bits should be well washed in clean water, thoroughly dried, and rubbed over with a little neatsfoot oil. The leather should be kept soft and pliable by using some dressing. Any one of the proved commercial compositions is suitable and cheap.

Heavy harness does not require the same attention, but it must be kept pliable and tough by oiling at regular intervals. Leather which is not treated soon becomes hard under our dry conditions, and cracks, while the stitching decays. A very suitable dressing is pure neatsfoot oil. Some very effective and cheap mixtures are on the market for dressing heavy harness.

Atherton Tableland Maize Board—Traffic in Maize.

An Order in Council under the Primary Producers' Organisation and Marketing Acts has been issued to deal with the traffic in maize on the Atherton Tableland. The Acts now provide that all maize grown on the Atherton Tableland must be delivered by the growers to the Board or its agents by the nearest road or railway, under conditions fixed by the Board by notice published in any newspaper circulating in the district. Except for delivery to the Board or its agents, a grower must not remove any of the commodity from his premises without the prior consent of the Board; any person doing so will be liable to a penalty of not more than £500.

No person shall remove any maize except with a permit from the Board authorising him to do so. This permit will give the conditions and the period of duration for such removal, as determined by the Board. The Board may refuse to grant a permit without giving reasons. The permit must always be carried, and must be produced for inspection by any member or inspector of the Board or member of the Police Force. The Board may appoint any persons to be inspectors.

Any member or inspector of the Board, or police officer, may, at any place within a radius of fifty (50) miles from the boundary of the area concerned, examine any vehicle suspected of carrying any of the commodity, may order the driver to stop for sufficient time to allow any goods carried to be inspected, and may seize any of the commodity found. Any person disobeying such orders shall be liable to a penalty not exceeding five hundred pounds (£500).

In any prosecution the averment that maize concerned is part of the commodity will be deemed to be proved in the absence of proof to the contrary. The Commissioner of Railways or any shipowner may, on the request of the Board, without incurring liability, refuse to carry any of the commodity, except Interstate consignments.

THE INCOME TAX ASSESSMENT ACTS, 1922-1929 (FEDERAL).

The INCOME TAX ACTS, 1924-1929 (STATE).

The LAND TAX ACTS, 1915-1929 (STATE).

NOTICE is hereby given that every person, firm, and company liable to make returns under the above Acts are required duly to make and furnish to me on the prescribed form or forms a return of—

(a) His or its income of the year ended **30th June, 1930**, and

(b) Particulars of land owned at midnight on **30th June, 1930.**

The returns are to be furnished not later than the dates set out hereunder:

(1) INCOME TAX RETURNS (STATE AND FEDERAL COMBINED RETURN):—

Due date for lodgment of returns:

(a) Employees only or persons in receipt of income from Property only (use Form B), **31st JULY, 1930.**

(b) All other persons and firms (use Form A), **31st AUGUST, 1930.**

(c) All companies (use special Forms provided), **31st AUGUST, 1930.**

(2) LAND TAX RETURNS (STATE ONLY), 30th SEPTEMBER, 1930.

Returns are to be addressed to the Commissioner of Taxes, State Government Insurance Building, Brisbane.

Penalty for failure to render a return by the due date, £100.

Dated this Nineteenth day of June, 1930.

H. MAGEE,
Commissioner of Taxes and Deputy Federal Commissioner of Taxation.

NOTE.—Return forms may be obtained at any Post Office or Office of Clerk of Petty Sessions, or at the Land and Income Tax Office, Brisbane.

Postage on all returns must in all cases be paid by the sender.

TAXATION RETURNS.

DUE DATES FOR LODGMENT.

Attention is drawn to an advertisement in this issue calling on all persons liable to furnish Federal and State Income Tax returns to forward same to the Commissioner of Taxes, State Government Insurance Building, George street, Brisbane, on or before the **31st July** in the case of employees or persons in receipt of Income from property only, and on or before the **31st August** in the case of all other persons or Companies, and to forward State Land Tax Returns to the same address on or before the **30th September** next. It should be noted that if any person or Company liable to make any return fails to do so by the due date, he or it is liable to a penalty of £100.

Forms are obtainable at Post Offices, Offices of Clerks of Petty Sessions, and at the Office of the Commissioner of Taxes, State Government Insurance Building, Brisbane.

The Pastern.

In judging of the points of a horse the conformation of the pastern is generally recognised by horsemen to be among the features to which leading importance attaches, this being on account of the intimate bearing which it has both upon the question of the wearing capacity of the legs and character of the action, while in the case of hunters the conformation of this joint, moreover, is of some influence as regards the question of their galloping and jumping.

The essentials sought for in good pasterns, briefly summed up, are that they should be well sloped and of adequate length. Both the length and the degree of slope, of course, vary considerably according to the breed, and these terms are therefore to be taken in a comparative sense. In thoroughbreds, for instance, the pasterns are always longer than they are in less well-bred horses, while they are relatively short in cart horses, as compared with well-bred horses of the light class. Similarly, in regard to the question of slope, one looks for more obliquely placed pasterns in the latter type of horse than in heavy horses used for slow draught work.

33 Gallons Daily from Five Cows.

Near Land's End there is a pedigree Guernsey herd owned, milked, and managed by Mr. E. Gerrish, of Carrallack House, St. Just, Cornwall. This herd, rationed under the Boutflour system, was the first to complete a 1,000-gallon average in the Cornwall Milk Recording Society, and for three successive years, against all breeds, has won the inter-herd challenge cup competition organised by this society.

News has just reached us that one of the cows in the herd, "Chorleywood Programme 3rd," is still adding to her previous wonderful records, and is now milking heavily with her ninth calf. She was born in April, 1920, was unfortunately not recorded during her first lactation, but has since yielded in consecutive lactations 604, 900, 1,123, 1,250, 1,084, 1,642, and 1,290 gallons. She is showing every promise of producing another heavy yield with her ninth calf. All of her calves (seven heifers and two bulls) are living. To give some idea of how Mr. Gerrish has developed the heavy milking capabilities of his Guernseys it might be mentioned that from five cows at one time he maintained an output of about 30 gallons daily for a considerable period, and on one day produced no less than 33 gallons from these five Guernsey cows.—"Live Stock Journal" (England).

Peanut Board.

The Governor in Council has approved of a Notice of Intention to create a reconstituted Peanut Board for a period of ten years. This Peanut Board will apply to all peanuts produced in Queensland. The Board to administer it will consist of four (4) elected representatives of the growers and the Director of Marketing.

All the commodity will be diverted from the growers and become the property of the Board as owners. The peanuts must be delivered to the Board in an unshelled condition, and a grower shall not remove any of the peanuts produced by him from his premises, except for delivery to the Board or its agents, unless the prior consent of the Board has been obtained.

Persons entitled to vote at a referendum or an election shall be those who have produced peanuts for sale in Queensland at any time during a period of twelve (12) months immediately prior to the poll. If a reconstituted Peanut Board is created, the present Peanut Board will go out of existence, and the new Board will take over all assets and liabilities of the old Board.

The existing Peanut Board Levy Regulations dealing with levies to provide for storage facilities, &c., shall continue to be operative during the currency of the new Pool.

Any petition for a poll to decide whether or not the new Pool shall be created must reach the Minister for Agriculture and Stock, Brisbane, before the 30th June, 1930, and must be signed by at least fifty (50) peanut growers.

Nominations for the growers' representatives on the new Board must reach the Under Secretary, Department of Agriculture and Stock, Brisbane, before 5 p.m. on 30th June, 1930. These nominations must be signed by at least seven (7) persons who have grown peanuts for sale during the preceding twelve months.

At the same time nominations are invited until 5 p.m. on the 30th June, 1930, for the election of four (4) growers' representatives on the existing Peanut Pool. Each nomination is to be signed by at least seven (7) persons who have had growing peanuts on areas of not less than one-half (½) an acre at any time during the last twelve months. These latter additional nominations are necessary pending the creation or otherwise of the new Pool. Full particulars will be found in the *Government Gazette* of the 31st May, 1930.

Cheap Experience.

To a shrewd, practical man there is nothing more instructive than a walk over somebody else's farm, for he will be able to note how the land is farmed and the various methods applied. Such a man may learn much by just watching what others are doing in another part of the country. Then, again, by noting how cattle are fed and what rations are being given, the keen man can pick up many a wrinkle worth remembering when he gets home again. Tours are good for the average farmer; they help to give him new ideas and to broaden his outlook, and so inspire him to better farming practice. While it is well to use the same farm for years and years, yet at the same time a man can stay too long in his own locality absorbed in his own methods, and thus may be ignorant of some of the improved methods that are being used outside his own narrow little circle.

Sheep and Wheat—A Valuable Combination.

Sheep are indispensable on the wheat farm. In the control of weeds, in improving the fertility of the land, and in many other ways their indirect value is often of greater importance than the cash return from wool, mutton, &c.

Briefly, the points in favour of combining sheep with wheat are as follows:—

(1) They consume the straw left after the harvest.

(2) They turn weeds to profit, and prevent them from seeding at times when the farmer is unable to deal with them owing to pressure of other work.

(3) Their manure improves the fertility of the land.

(4) When the season is so bad that the crops fail to produce grain, sheep turn them to profitable account.

(5) The income from the farm is rendered more certain, as the farmer is not entirely dependent upon a crop which may be destroyed by fire or hail.

(6) Sheep necessitate the adoption of a rotation, which tends to improve the fertility of the land, check crop diseases, and increase the yield of crops.

(7) They can be used to feed off crops that need such a check.

(8) A supply of cheap mutton is made available for the farmer's own household.

(9) To the above may be added the pride and pleasure derived by the farmer from the possession of a good flock.

—A. and P. Notes, N.S.W. Dept. of Agric.

The World's Grain Exhibition in 1932.

A world's grain exhibition and conference of wheatgrowers will be held at Regina, Canada, from 25th July to 6th August, 1932. Few realise the magnitude of the undertaking and the far-reaching influence it will exercise upon the basic industry of agriculture, particularly upon the quality and quantity of grain production the world over. As Regina is the heart of the largest area in Canada producing wheat and other grain, it was considered the logical point for the exhibition which is being supported by the Federal and Provincial Governments. Entries and exhibits will be received up to 1st March, 1932, to give ample time for judging and the arrangement of each exhibit. The benefits to the agricultural industry the world over to be derived from friendly competition in the "show-ring" of the best grain produced in every land is at once apparent. The prize list provides every indication that its compilation has been made as attractive as possible so that the number and representative nature of the exhibits would reach the maximum. Over $200,000 (£41,667) is being offered in cash prizes for wheat, barley, maize, rye, buckwheat, rice, millet, field peas, soybeans, sunflower, field root seed, and collections of garden vegetable seed, in all comprising nineteen sections subdivided into 55 classes, with 1,600 prizes varying from $2,500 (£500) to $10 (£2). The entrance fees are very modest, particulars of which can be obtained from the Canadian Trade Commissioner, Melbourne.

The conference in connection with the exhibition will be of immeasurable importance, and every effort is being made towards ensuring it being representative of the world's best thought along practical and scientific lines. Experts from many countries, men who are recognised leaders in their own particular fields of activity, are being solicited to take part. In this way, it is hoped to make the conference the "clearing-house" for world thought and knowledge on every branch of field crop production and marketing.

Another Credit Entry in the Cow's Account.

The casein of milk in powder form is used for plywood paint and printers' ink, dressing table requisites, and imitation leather, and now Mr. E. J. Forster, a research chemist of Manly (New South Wales), claims that by combining casein and sawdust or shavings, he can make a board suitable for building material. The board is said to be of extraordinary strength, durability, cheapness, non-absorbent, and non-inflammable, and is to be marketed at 35s. a hundred square feet, compared with 52s. for building pine.—"*The Farmer and Settler.*"

A "Shell" Story for Small People.

A charming little publication for children has been produced by the Shell Company of Australia, Limited, for free distribution on application throughout the Commonwealth. The illustrations have been well done by the young Australian artist, Miss Sheila Hawkins, and much attention has been paid to detail. The half-dozen plates have been produced in four colours, and there is a generous sprinkling of black and white drawings. The simple story is that which has appealed to the child mind since time immemorial—of fairies and goblins, and the small girl who is waylaid and ushered into the inner sanctums of fairly life. With its Australian setting it promises to have a wide appeal wherever young people are gathered together—at school, at home, and at play. The booklet is well prepared on tinted art paper, and is generally significant as indicating the upward trend of commercial publications in this country. It is an all-Australian production.

A copy is obtainable on application to the Shell Company, Department Advertising.

Acquisition of Strawberries by Committee of Direction.

Regulation 188 made under the Fruit Marketing Organisation Acts on the 15th May, 1930, provided for the conducting of a ballot of all strawberry growers on the question as to whether an Order in Council be issued declaring that strawberries grown in Queensland for a period of twelve months from the 15th May, 1930, for sale to fruit canners or as fresh fruit on a wholesale basis shall be acquired by the C.O.D. as the owners thereof. A ballot was accordingly conducted by the C.O.D., with the result that, of 613 ballot-papers issued, 354 were returned; of these, 273 were in favour of the acquisition, 72 were against, and 9 were informal. Thus 79.1 per cent. were in favour, and, as this is in excess of the required 60 per cent., the Order in Council has now been issued.

The Order provides that all strawberries grown in Queensland and coming into the possession of any person for the purpose of selling or offering them for sale to any fruit canner or preserver, &c., or for fresh fruit on a wholesale basis, during the period from 10th June, 1930, to 14th May, 1931, shall be acquired by the C.O.D. as owners thereof. The C.O.D. has the power to do all necessary things for the purpose of effectively carrying out the marketing of such strawberries as owners thereof on behalf of the growers. The Order shall have no effect so as to prejudice any interstate contracts which had been entered into prior to such acquisition. The Order shall remain in force from the 19th June, 1930, until the 14th May, 1931.

Reduced Production Costs Mean More Profit.

The urgent need in Australia is to lower the cost of production of the commodities of which we produce a surplus—wool, wheat, butter, and fruit. With falling values for these staple commodities it is essential, if we are to meet the demands of foreign competition, to increase the productivity of each individual worker and cut production costs to the minimum.

The farmer generally pays more attention to the price of his products than to the cost of producing them. But the prices of those commodities sold on a world market—wheat, wool, butter—are largely beyond the control of the farmer. On the other hand, the costs of production, within limitations, are subject to the farmer's control. Various items entering into production costs are virtually fixed. These include taxes, land capital costs, upkeep, and certain general expenses. But the major costs of production, excepting only land capital costs, are not fixed. They vary with the intelligence and skill of the farmer, and the power and equipment he applies to them. It is in the preparation of the land, seeding, tillage, cultivation, harvesting, and hauling of the crops that the major expenses are incurred, and to the degree to which these can be reduced, the profits of the farmer can be increased. The farmer will be compelled to accept world prices for his products so long as he must sell a surplus above domestic needs in the world markets. World consumers will buy from him only to the extent that he can sell as cheaply or more cheaply than other sellers.—Dr. A. E. V. Richardson, in the "Journal of Agriculture," South Australia.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MEASURING BABY'S FOOD.

YOU may think that this is a very simple matter, but it is not so simple as it seems. On the contrary, we often find it a most difficult matter, and sometimes even impossible, to find out by the most careful questioning how much food a baby is really taking. Mothers reckon in teaspoons and tablespoons, but their spoons are not all of the same size. For instance, most of the tablespoons now used contain between one and a-half to two tablespoonfuls. This is a very serious cause of mistakes. If a mother tells us that she is giving to her baby at each meal eight tablespoonfuls of milk carefully measured with her own tablespoon, we think he is probably really getting about twelve tablespoonfuls; but we are not sure. He may be getting ten tablespoonfuls or perhaps fifteen. The most careful written directions as to quantity are of no value unless we know exactly what the mother measures the quantity with.

In measuring solids such as sugar or dried milk the danger of making large and serious mistakes is greater still. A teaspoonful of sugar is a quantity that depends not only on the size of the spoon, but on how it is filled. It may be a strictly flat teaspoonful, in which the sugar has been carefully scraped off level with the edge of the spoon. It may be a heaped teaspoonful which with the same spoon is nearly three times as much. It may be an "ordinary" teaspoonful, which is neither one nor the other, but may be anything in between. Even if we all use flat teaspoonfuls we may go seriously wrong, for some powders such as milk, sugar, and dried milk are compressible. That is, much more can be got into a flat teaspoonful if the powder is squeezed. No two women squeeze exactly alike, or with the same strength. Even the same woman does not always squeeze the same. She probably squeezes harder, if she has just had a few words with her husband. Some nurses were asked to measure flat tablespoonfuls of dried milk all with the same spoon, and by careful weighing it was found that none of the tablespoonfuls weighed the same; and the highest weight was more than twice as much as the lowest.

How to Measure Correctly.

In measuring milk and water do not, as a general rule, use spoons at all. Most feeding bottles are marked with divisions into ounces and tablespoonfuls, and these divisions are usually sufficiently accurate. In them a tablespoonful is exactly half an ounce. It is shorter to say "one ounce" than "two tablespoonfuls," and it is better, for if we can get mothers to think in ounces, they will not be muddling with spoons. If you suspect that your bottle is not correctly marked, or if you want to be very precise, get a glass measure marked in ounces from any chemist's shop.

In measuring powders like sugar or dried milk never use any sort of spoon but one. That is a "clinic tablespoon" or a "clinic teaspoon" which is of a fixed size. The two "clinic spoons" may be bought at any chemist's for one shilling, and it will be the best shillingsworth you have ever bought. Do not dip the spoon into the sugar basin or tin of condensed or dried milk. Pour the sugar or dried milk into the spoon till it is overful, but do not squeeze it. Take a knife held at right angles to the spoon and gently scrape off what lies above the level of the spoon in one sweep. You will then quickly and easily measure a true flat spoonful. Remember that "clinic" spoons should always be used to measure sugar, dried milk, and other powders, but they are not needed to measure water, milk, and other fluids.

RESPIRATORY INFECTIONS.

Influenza and other Ailments.

The "common cold," which was the subject of our discourse last month, is not the only disease whose causative germs exist in the secretions of the mouth, nose and throat. There are a host of them. Influenza, which at long intervals becomes a world-wide scourge, spreads in exactly the same way. Perhaps it would be more correct to speak of the influenzas, for there seems to be a number of similar infections as yet indistinguishable, ranging from a virulent and fatal infection to the "common cold," which is so unwisely despised and neglected. Measles commences just like a "cold," for which it is usually mistaken until the fourth day of the disease, when the rash appears on the skin. Whooping cough commences as an ordinary cough, which gradually gets worse, but cannot be recognised until a week or more have passed. Both these diseases are most infectious in the early stage, before their nature is recognised, and are therefore most easily spread. They are most common and most fatal in children under five, to whom they are conveyed directly by fingers, toys, &c., contaminated by the saliva and mucus from diseased mouths and throats, or by inhaling these secretions in the form of a fine spray which is coughed out by the sufferers. Diphtheria is similarly spread, but this disease will have to be dealt with in another discourse. The list is not yet exhausted; to it we must add scarlet fever, meningitis, and infantile paralysis, whose epidemics leave so many children sadly crippled. The last two are spread entirely not by sick people, but by apparently healthy carriers of the disease germs.

Teach Children Clean Habits.

As these diseases are conveyed by the secretions of the organs concerned in breathing or respiration, it is convenient to speak of them as respiratory infections. These respiratory infections are not lessened in any way by ordinary sanitation, which has so greatly reduced the number of intestinal or bowel infections. They are not affected at all by good or bad drainage, by nasty smells, by flies, mosquitoes or other insects. They are certainly increased by overcrowding. They are extremely difficult to deal with by isolation, partly because they are often very infectious before the sufferer realises that he is really ill, partly because most people would resent being isolated for complaints which they regard as trivial, and which indeed are so in many cases. The worst spreaders are not the very sick but those who are not too sick to go about and mix with other people. These diseases spread with the greatest ease among children, because their mothers have not understood the importance of teaching children clean habits. As is well said in the following quotation:—

> "Not only is the saliva made use of for a great variety of purposes and numberless articles are for one reason or another placed in the mouth, but for no reason whatever, and all unconsciously, the fingers are with great frequency raised to the lips or the nose. Who can doubt that if the salivary glands secreted indigo, the fingers would be continually stained a deep blue, and who can doubt that if the nasal and oral secretions contain the germs of disease, these germs will be almost as constantly found on the fingers? All successful commerce is reciprocal, and in this universal trade in human saliva the fingers not only bring foreign secretions to the mouth of their owners, but these, exchanging them for their own, distribute the latter to everything the hand touches. This happens not once, but scores and hundreds of times during the day's round of the individual. What avails if the disease germs do die quickly? A fresh supply is furnished each day. Besides the moistening of the fingers with saliva, the mouth is put to numerous improper uses, which may result in the spread of infection. It is used to hold pins, strings, pencils, paper, and money. The lips are used to moisten the pencil, to point the thread for the needle, to wet postage stamps and envelopes. Children have no instinct of cleanliness, and their faces, hands, toys, clothing and everything they touch must of necessity be continually daubed with the secretions of the nose and mouth. It is well known that children between the ages of two and eight years are more susceptible to scarlet fever, diphtheria, measles, and whooping cough, and it may be that one reason for this the great opportunity that is afforded by their habits at these ages for the transfer of the secretions. Infants do not, of course, mingle freely with one another, and older children do not come in such close contact in their play, and they also begin to have a little idea of cleanliness."

It must not be supposed that these unclean habits are confined to children. At any post office daintily dressed women may be seen needlessly licking dirty postage

stamps. Go to your bank, and the very respectable cashier will count your notes, leaving on each a collection of his own germs, meanwhile ingesting those already deposited on them by other people. Even the trained hospital nurse may be observed to moisten her fingers on her lips as she turns the pages of her notebook, heedless of the disease germs which exist in hospital dust. Let us hope that the next generation may be trained in cleaner habits. If so, they will be more healthy.

MENACE OF THE HOUSE-FLY.

SOME SUGGESTIONS FOR CONTROL.

Although the season during which the house-fly constitutes the most serious nuisance is beginning to draw to a close, it is still proving a source of great annoyance to housewives, and especially, perhaps, because of the disabilities often attached to rural conditions, to those "outback." Outbreaks of gastro-enteritis among young children have lately caused considerable anxiety, observes the Assistant Organiser of the New South Wales Agricultural Bureau in the current "Bureau Record," and the result of this disease alone, carried as it often is by the fly, should be sufficient to warrant the use of every method possible to control this dangerous insect. The habits of the fly, too, are so objectionable that the more we know of it the more we realise that it constitutes a menace to the community.

The ordinary house-fly needs little description. It is all too common and easily recognised. If we were to examine the insect closely we would see that its body and legs are covered with a great number of fine hairs. Each foot is provided with two tiny pads, which also are covered with minute hairs, secreting a sticky substance by means of which the fly holds on to the walls, ceiling, &c. The sticky substance, together with the hairs, picks up innnumerable germs as the fly wanders through garbage receptacles, drains, stables, sick rooms, and other places where harmful bacteria abound. These, of course, are readily carried to the kitchen, dining table, and, worst of all, to the baby's dummy and bottle.

Another means by which the fly distributes germs is by its method of obtaining nourishment. Its mouth is rather a singular structure, prolonged into a kind of trunk or proboscis. Thus any food it requires must be sucked up through this trunk in a liquid form. When the insect lights on a piece of solid food, it immediately proceeds to soften it by exuding some drops of moisture from its own digestive system, then slowly sucks the moistened food into its mouth. It thus leaves behind, on the food which we may be eating some liquid from its own internal organs, teeming, probably, with minute bacteria of many kinds. These, if our systems are not in a strong and healthy condition, may do untold damage by setting up within us the beginnings of diseases, such as typhoid, tuberculosis, and summer digestive complaints, especially in children.

Life History.

The life history of the house-fly is one which adds to our objection to its frequenting our living quarters. It is always a lover of filth and will seek any decaying animal or vegetable matter on which to deposit its eggs, knowing that the young will have ample organic matter for food when they are hatched. The eggs, which are minute white oval-shaped objects, about one-twentieth of an inch in length, are deposited in clusters; about 120 to 150 eggs are laid at a time, and as each female fly can lay as many as four deposits of eggs in her lifetime, we have some idea of the rapidity with which the insects increase. In warm weather the eggs hatch and the larvæ emerge in about twenty-four hours.

These tiny creamy white maggots are pointed at the head and broaden out to a blunt posterior end, and when matured are about one-quarter to one-third of an inch in length. They eat greedily, increasing rapidly in size, and shed their outside skin three times before they enter the pupal stage, which is reached in from five to seven days. The last skin of the maggot encloses the pupa, in which stage it remains for a few days, varying according to weather conditions, after which the skin breaks and the adult fly emerges.

Probably the most favoured spot for breeding is the stable manure heap, but carcasses of animals, heaps of decaying vegetable matter, sanitary pans and pits, neglected garbage tins—in short, anywhere where organic matter is allowed to decay, especially in moist places which are not too dark nor exposed to the strong rays of the sun, make ideal breeding places.

A Difficult Problem.

The control of flies is a very difficult problem, and no effective measures should be considered too much trouble in combating the pest. Firstly, the number of breeding places should be reduced to a minimum.

Garbage tins should be kept covered and as dry as possible, the contents being burned at regular intervals. Fowl yards, pig and calf pens, and milking yards should be a good distance from the house and kept as clean and dry as possible. Heaps of manure and compost, kept for the garden, should be tightly compacted and covered, if possible. If the heap is treated with borax (1 lb. to 8 cubic feet of manure) sprinkled on the surface and sprayed with water, breeding will be reduced considerably. Sanitary pits and pans, if kept covered and treated with liberal supplies of ashes, sawdust, or dry earth, become safe from the breeding of flies to a considerable extent. Various disinfectants or kerosene will destroy the maggots if allowed to hatch.

No effort should be spared in keeping flies from the house. The screening of doors and windows (better still of verandas) is the most efficient means of preventing the pest from entering the house. The framework for the gauze should be made of well-seasoned timber, otherwise it will warp, thus making cracks through which the flies can crawl. The fireplaces, too, should be screened, as the flies readily find their way down the chimney.

Protective Measures Well Worth While.

This, of course, incurs considerable expense, but the preservation of health and the saving of untold annoyance and waste of food attacked by the fly repays the outlay, and the precautions mentioned should be regarded as of primary importance in home improvement. Sticky papers are to be recommended if out of reach of children and pets—say, suspended in the centre of the room. Many types of traps, all of which are more or less efficient, are on the market; a bait of moist tea-leaves and sugar seems to attract the insects into the trap and is less objectionable than many other types of bait. Sweetened milk and water, to which formalin has been added (one teaspoonful of formalin per cup) placed in saucers out of reach of infants and pets, kills many flies, but they are apt to fall round the room and become objectionable if not swept up immediately.

Closing a room and spraying with one of the many commercial liquids or insect powders is also effective. This is best done at night, so that the dead flies may be swept up early in the morning.

At all times it should be the duty of every member of the community to take all possible measures to fight the fly and to keep food free from its attacks.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out

antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

FLOWERING SHRUBS.

Lagerstrœmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

PROPAGATION BY CUTTINGS AND LEAVES.

The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated it is of little value in the bedding department.

Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, and soil has been attended to, the whole of the cuttings may be put in during autumn and rooted before the cold weather comes. It may be laid down as a general rule that all stout, free-growing cuttings prefer a strong loamy soil, while those of a more delicate nature and that have fewer roots are safest when planted in light sandy soil containing a large proportion of leaf mould.

The cuttings should be planted firmly, in rows about 6 inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead should the weather be dry. As soon as rooted, or at least before the approach of the cold, wet weather, they should be placed in boxes, pans, or pots, in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring.

Pentstemons, phloxes, pinks, antirrhinums, and a host of other bedding plants of robust constitution may be increased in the autumn in this way. Boxes are most convenient for these purposes. The bottom should be pierced with several holes an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled with sandy soil, using loam, leaf mould, or whatever mixture the nature of the cuttings would require.

Under certain conditions buds are formed on the leaves of a large number of plants, such buds being called adventitious, to distinguish them from the stem or normal buds, which are found on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself.

It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation. Such plants as begonias, gloxinias, and a few others of more or less succulent nature are the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. In some cases where leaf-cuttings have been tried, roots were freely developed but no bud was formed. Camellias may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating house for several years.

Where it is desirable that a new plant should be propagated as abundantly and as rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem cuttings in the propagating frame and treat as advised below. To anyone acquainted with the nature of the following list of plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants. Begonias, clianthus, gesnera, gloxinia, hoya, lilium, watercress, and many others may be propagated by means of leaves or portions of leaves.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of the year for the operation. Gloxinias may be dealt with all times of the year when leaves are available, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base.

Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, pots may be used, filling the pots half-full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A frame in a propagating house will be the most suitable place for the cuttings till rooted. In a small bush-house a position on a shelf would answer equally well for gloxinia cuttings.

Begonias may be treated as suggested for gloxinias; or, if to be propagated on a large scale, a frame containing cocoanut fibre may be used, pegging the begonia leaves on to the fibre.

Reference may be made to the reproductive nature of some fern fronds, especially the aspdeniums, nephrodiums, aspidiums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are very much the same as those of the plants themselves.

The scales which form lilium bulbs may be used for propagation, as if fresh when gathered and placed in sandy soil they root and form small bulbs capable of growing into large plants. All these exceptional ways of obtaining a stock of plants are only resorted to in exceptional cases; they are chiefly of physiological interest, showing as they do how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal proper means to fulfil the functions of increase or reproduction.

VALUE OF EARTH WORMS.

It is evident that not every gardener can decide whether the common earth worm is a friend or foe. Who has not seen the gardener, when digging, industriously remove every worm found?

Now, speaking generally, these creatures are more friends than otherwise, although they are far too numerous in some gardens at certain periods of the year. As a rule, they do more good than harm by allowing water and air to pass through the soil more freely, and in other small ways assist the gardener.

They may do a little harm by working among the roots of seedlings, also, of course, on lawns, bowling and golf greens, where they may be regarded as pests, rendering the use of lime water necessary to eradicate them.

SLUGS AND SNAILS.

Slugs and snails are troublesome in many gardens—in some more so than in others, and if they are not dealt with in some way a good deal of damage may be done during the year.

The value of lime and soot is pretty well known, but both must be used carefully, or the plants it is intended to protect may be damaged. Ashes in a dry state are also effective in keeping them off. In using these insecticides they must be used in lines or around the plants in a dry, powdery form.

If the garden soil is regularly limed and kept sweet there is less chance of the slug increasing. Watering with alum water is also death to snails and slugs.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches with consequent overproduction and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application or paradichlor, buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 ft. according to the size of the tree, will form the future head of the tree and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertiliser, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertiliser or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The planting of citrus trees this season has been inextensive, but there is a much better outlook for orange production than has been previously offered, and attention should be confined mainly to good varieties of this class—viz., Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour,

also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lay about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock. In earlier years citrus planters were much dissatisfied with Southern supplies, which led to the establishment of local nurseries and later to bud selection. There is certainly sufficient enterprise and energy in the Stanthorpe district to make a similar attempt. Its application only is required.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	July, 1930. Rises.	July, 1930. Sets.	August, 1930. Rises.	August, 1930. Sets.	MOONRISE. July, 1930. Rises.	MOONRISE. Aug., 1930. Rises.
					a.m.	a.m.
1	6.46	5.5	6.37	5.19	10 36	10.50
2	6.46	5.5	6.36	5.20	11.9	11.25
3	6.46	5.5	6.36	5.20	11.43	12.0
					p.m.	p.m.
4	6.46	5.6	6 35	5.21	12 15	12.43
5	6.46	5.6	6 34	5 22	12 49	1.33
6	6.46	5 7	6.33	5.23	1.22	2.25
7	6.46	5.7	6.33	5.23	2.1	3.19
8	6.46	5.8	6 32	5.24	2.47	4.13
9	6.45	5 8	6 31	5 24	3 36	5 8
10	6.45	5.8	6.30	5.25	4 28	6.4
11	6.45	5.9	6 29	5.25	5.24	6.52
12	6.45	5.9	6 29	5.26	6.18	7.50
13	6.45	5.9	6.28	5.26	7.11	8.42
14	6.45	5.10	6 28	5.27	8.7	9.34
15	6.45	5.10	6.26	5.27	9.0	10.27
16	6 45	5.11	6.25	5.28	9.53	11.27
17	6 44	5.11	6 24	5.28	10.46	...
						a.m.
18	6.44	5 12	6.23	5.29	11.39	12.27
19	6 44	5.12	6.22	5.29	...	1.31
					a.m.	
20	6.43	5.13	6.21	5 30	12 38	2.34
21	6.43	5.13	6.20	5·30	1.37	3.39
22	6.43	5.14	6 19	5.31	2.43	4.41
23	6.42	5 14	6 18	5.31	3.47	5.35
24	6.42	5.14	6.17	5.32	4.54	6.21
25	6.41	5.15	6.16	5.32	5.58	7.2
26	6.41	5.15	6.15	5.32	6.58	7.36
27	6.40	5.16	6.14	5.33	7.48	8.11
28	6.40	5.16	6.13	5.33	8.30	8.45
29	6.39	5.17	6.12	5.33	9.7	9.19
30	6.39	5.17	6.11	5.34	9.40	9.57
31	6.38	5.18	6 10	5.34	10.15	10.40

Phases of the Moon, Occultations, &c.

3 July	☾ First Quarter	2 3	p.m.
11 ,,	○ Full Moon	6 1	a.m.
19 ,,	☽ Last Quarter	9 29	a.m.
26 ,,	● New Moon	6 41	a.m.

Apogee, 13th July, at 11.36 p.m.
Perigee, 26th July, at 8.6 p.m.

On the 16th Venus will pass from west to east of Neptune, on its northern side. Neptune will be invisible without telescope or binoculars, but Regulus, the brightest star in the fine constellation Leo, will be 2¼ degrees westward of Venus. They will be approaching the western horizon, 12½ degrees north of west, about two hours after sunset. Observers using a telescope will find Neptune only 2 minutes westward of Venus, but 40 minutes southward.

Mercury will rise at 5.37 a.m. on the 1st. On the 15th it will be on the far side of its orbit, beyond the Sun and invisible.

Venus will set at 7.47 p.m. on the 1st and at 8.2 p.m. on the 15th.

Mars will rise at 6.12 a.m. on the 1st and at 3.0 a.m. on the 15th.

Jupiter will rise at 6.12 a.m. on the 1st and at 5.31 a.m. on the 15th.

Saturn will be in conjunction with the Sun on the 1st and therefore invisible. It will be on the far side of its orbit, about 885,000,000 miles beyond the Sun. On the 15th it will rise at 4.1 p.m.

The Southern Cross will reach the highest point of the circle, 60 degrees in diameter, which it makes daily around the south-celestial pole, at about 6 p.m. on 1st July and about 4 p.m. on the 31st. It will then be on the meridian due south, in an erect position, reaching a height of 57 degrees at Brisbane, but only 50 degrees at Charters Towers, or 49 degrees at Townsville, reckoning by a line through the cross from the two pointers.

1 Aug.	☾ First Quarter	10 26	p.m.
9 ,,	○ Full Moon	8 58	p.m.
17 ,,	☽ Last Quarter	9 31	p.m.
24 ,,	● New Moon	1 37	p.m.
30 ,,	☾ First Quarter	9 57	a.m.

On the 5th Mercury will pass Neptune, apparently very close to it on its northern side. Telescope or binoculars will be required to see the latter. The two planets will set an hour and a-half after the Sun, about 6 degrees further north on the western horizon.

The Moon will pass from west to east of Saturn at midday on the 6th when below the horizon. When both become visible in the east, soon after sunset, Saturn will be about 6 degrees north-westward of the gibbous moon.

Mars will be in conjunction with the Moon at 4 a.m. on the 20th, an hour and a-half after they have risen, Mars being 4 degrees to the southward of the Moon.

On the following morning, at 8 o'clock, the Moon will pass 5 degrees northward of Jupiter, but too much in the direction of the Sun to be noticeable. On the 24th Neptune will also be passed in the daytime.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

CONTINUING his interesting review of the development of the sugar industry in Queensland since federation, Mr. Easterby tells the story of the establishment of the Central Mills at Babinda and South Johnstone. The second instalment of Mr. Currie's account of the Brown Cutworm, together with two fine plates in colour by Mr. Helmsing, are in this issue. Mr. McGrath discusses the position and the conditions of the dairying industry in this State, and reminds us of its national importance at the present time. Mr. George Williams has a note on some manurial experiments with pineapples. Mr. Rudd has an informative article on Contagious Abortion; while Mr. Shelton gives an account of the activities at the recent Winter School for Pig Farmers. Mr. Wells's report on the work of the Callide Cotton Research Station, in an abridged form, is also published. The recent tour of a party of New Zealand farmers through a portion of South-eastern Queensland is described briefly. Some points in rural domestic economy are discussed by Mr. Bosworth, of the Queensland Agricultural College. Notes on the care of calves are supplied for the information of the young farmer. The Home and Garden section also contains a budget of topical and useful information. Taken all round the August Journal covers a wide range of matter of interest to all engaged in our basic industries.

The Governor's Speech.

SOME interesting references to rural industries were made by His Excellency the Governor, Lieutenant-General Sir John Goodwin, when opening the second session of the twenty-fifth Queensland Parliament. Referring to the measures of biological control of the prickly-pear pest, he said that so gratifying had been the success which had attended the administration of the prickly-pear lands of the State that the expenditure of the Prickly-pear Land Commission might now be considerably reduced. The present law made provision for an annual vote of £100,000 for the work of the commission. As that amount would not be required in future, a Bill would be introduced to reduce the amount to anticipated requirements.

Pear-destroying insects had done remarkable work, large areas once densely infested with pear being nearly cleared. To such an extent was that the case that notice of resumption for agricultural and mixed farming settlement purposes,

under the Prickly-pear Land Acts, had already been given in respect of thirty-three prickly-pear leases near Chinchilla, while similar action was being considered with regard to other prickly-pear leases comprising agricultural lands in close proximity to railways.

Forestry Problems.

HIS Excellency added that the forestry problems of Queensland had received very close attention. The rapid increase of importations of timbers had reacted heavily against the native forest and timber industries, whose operations had been at low ebb during the year. With a view to alleviating the situation, substantial rebates in the price of raw material from the State's forests had been made, and the assistance of the Federal Government towards safeguarding our timber industries against the dumping of cheap timber into the State had been sought.

The forest service through its prolonged experimental silviculture had demonstrated that valuable timber species could be reproduced in commercial plantations—a realisation not previously attained by any other country in the Southern Hemisphere—and silvicultural research abroad by specialists of the Queensland Forest Service substantiated the expectations of the Forestry Board in that regard.

Research into the problem of wood-taint in butter had been conducted with satisfactory results for Queensland pine, and investigations were being pursued into local shipworm-resistant timbers for use in wharfing.

Water Supply.

REFERRING to work in connection with water supplies, the Governor said that the Inkerman irrigation area had made further progress and there are now 198 farms, aggregating 6,000 acres, under irrigation. The value of irrigation for sugar-cane production could be judged by the fact that last season the average at Inkerman was 27 tons to the acre compared with an average of 18 tons for the State.

The artesian boring branch of the Irrigation Department was chiefly engaged during the year on the construction of trust bores. Whynot bore, which is situated on the Grey Range near Quilpie, was sunk to a depth of 3,290 feet, and an artesian flow of 925,000 gallons per day was obtained. This bore will serve approximately 130,000 acres of leasehold land, and the water will travel 66 miles of drains.

The Sugar Industry.

MENTIONING matters in connection with the sugar situation in Queensland, the Governor stated that the quantity of raw sugar manufactured in Queensland last season—503,000 tons—was the second largest in the history of the State, being only 3,000 tons below the record output of the previous season. Exports totalled 197,000 tons, the average return to the producer for the total output being £20 5s. 10d. per ton compared with £20 17s. 11d. for the previous season. Present indications point to the yield of Queensland sugar for the current season being in the vicinity of 480,000 tons. Hopes were entertained that the forthcoming Imperial Conference would be able to arrive at an arrangement which would secure the retention of the reciprocal benefits of inter-Empire trade.

An Excellent Season—Crop Extension.

HIS Excellency, in referring to other rural activities, remarked that in the agricultural districts an excellent season had been experienced. There had been an increase of at least 15 per cent. in the volume of wheat production.

Satisfactory reports had been received respecting this year's tobacco crop at the Mareeba Tobacco Experiment Station. The Commonwealth Tobacco Investigations Committee, working in conjunction with State authorities, had extended exploratory plots into Central Queensland. It was proposed during the coming season to extend tobacco experimental work in Southern Queensland. Data published by the Council for Scientific and Industrial Research showed conclusively that Queensland had a promising future for the production of high-class smoking tobacco.

The cotton crop for the present season was expected to be substantially larger than the preceding one. Important developments in the cotton-growing industry of the State had also marked that period, and through the efforts of the Government the cotton-growers now operate their own ginneries and oil-mills.

Favourable seasonal conditions during the past year were reflected in the output of dairy produce, which reached a new record of over 76,000,000 lb. of butter and over 15,000,000 lb. of cheese.

The Passing of Mr. Pritchard.

THE death of George Henry Pritchard removed recently one of the ablest and hardest fighters for economic rights that the sugar industry in Queensland has had in the course of its long and eventful history. To meet Harry Pritchard, in friendly or hostile conference, was to meet a man ready to fight all the way, and to fight keenly, cleanly, and with all the force of a dynamic personality endowed with rare perception and appreciation of the facts of the case, in any cause that he espoused. With him as an advocate whether in court, conference, or the Press, the industry was well served. The best part of his life was spent in waging the battles of the sugar-growers in any field into which they were taken. As an authority on sugar organisation and legislation he was recognised by all sections of the industry. His early banking training stood to him well in the wider commercial world, and his grip of every phase of the industry, in all its altering circumstances, enabled him to set a course, as events demanded, with sanity and sagacity and success. His helmsmanship in the industry was marked by strength of mind and character that won him the respect even of "his friends the enemy," who paid willing and generous tribute to the high qualities, personal and otherwise, that he possessed. His passing is sincerely regretted not only by sugar producers, but by all interested in the things that matter in this young Commonwealth, as well as by those who knew him, and having known him appreciate the value of his devotion to the industry and the State he served so well.

The Dairy Industry—The Need of Scientific Research

THE urgent need of initiating investigations into Australian dairying problems has been pressed on the Commonwealth Council for Scientific Research. On examining the request, it became obvious to the Council that a considerable diversity of opinion existed as to the lines such an inquiry should follow. The Council therefore determined to seek further information before taking definite action. From a preliminary investigation, undertaken by Professor S. M. Wadham, of the University of Melbourne, much useful information has been obtained. His report is now before us, but in making it generally available the Council indicates that such action does not mean that opinions expressed by the investigator are necessarily its adopted views, nor that it is intended to follow in their entirety the recommendations made. Professor Wadham covered a wide economic range, right from the pasture to the pantry, in the course of a brief though comprehensive review. His general conclusions and recommendations are worth the attention of everyone engaged in the dairying industry. On the economic aspect, he says that no matter how much money and effort are spent on the scientific side of an industry, such outlay will be largely in vain if the organisation of that industry is unsound. Of these economic inquiries, the first is that of land tenure—this is a regional trouble, not very old in Australia; it will spread unless it is checked at an early date. The specific information required is the extent and conditions of short term land-tenure systems in the dairying districts of Australia and their influence on dairy production as far as it can be estimated. The next point is the distribution of dairy factories in districts with reference to overhead costs of manufacture, costs of transportation, and the natural limitations preventing the regrouping of factories. The last economic problem is a survey of the overseas market and the factors operating thereon. If the Commonwealth is to have an economics bureau, he believes, the first two of these should be well within its sphere of action. The co-operation of State Departments would, no doubt, be obtained. It is possible that the Department of Markets could undertake the third, or it may actually have the information at the present time.

On the production side, his opinion is that the industry needs assistance in six directions. As to veterinary and nutritional problems, these have already been reported on to the Council. As to pasture and pasture management, it is understood that plant introduction is already receiving attention from the Council's Division of Economic Botany. A broad pasture survey of the various dairy districts in the Commonwealth, coupled with carefully devised schemes of experimentation on management and manuring, will lead to satisfactory results. The field is vast; if the Council can provide additional agrostologists for the task, so much the better.

As to herd testing and the encouragement of the use of high-grade stock, these are matters which can be treated adequately by State Departments. The importance to the industry of subsidiary products, such as pig-raising, is great and requires careful study. It is in some ways a local problem and, requiring extensive areas and buildings, must remain a matter for State organisation. Professor Wadham also discusses educational and technical matters, and all his recommendations as to the training of factory operatives, technical control, and continuous research are worthy of every consideration.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VIII.

(b) Review of the Industry since Federation.

(Continued.)

WE may now proceed to the establishment of the Central Mills of Babinda and South Johnstone, as they were the outcome of the Report of the Royal Commission which was appointed late in 1910 but did not take the bulk of its evidence till 1911. This Commission was appointed by the State Government to inquire into and report upon the following matters relating to the sugar industry, i.e.:—

(1) Is it desirable that the Government should establish more Central Sugar Mills?

(2) If so, how many and where?

(3) What conditions should be imposed on advances to be made for the erection of such mills?

The Commission consisted of Messrs. R. A. Ranking, Police Magistrate, J. R. Paddle, and Dr. A. J. Gibson.

Applications for the establishment of Central Mills had been received by the Government from Babinda (Russell River), Bailey Creek and Daintree River, Daradgee (North Branch of Johnstone River), Freshwater (Cairns), Liverpool Creek, Tully River, Rockhampton, and Gympie and later on instructions were sent to visit Aloomba (Cairns), South Johnstone, Mourilyan Syndicate lands, Long Pocket (Ingham), Hamilton, Kelvin Grove, Silent Grove (Mackay), and Yeppoon (Rockhampton). After visiting the various sites proposed for Central Mills and hearing a large amount of evidence, the Commission recommended—

(*a*) That it was desirable that the Queensland Government should establish more Central Mills.

(*b*) In connection with the question of how many new mills should be built the Commission took into consideration the then milling power of the existing mills, the importation of foreign sugar and the possible increase in population. They pointed out that the average annual production for the years 1902-1909, inclusive, amounted to about 160,000 tons, and that the average annual imports of foreign sugar for home consumption for the years 1901-1910, inclusive, amounted to 46,306 tons, and they took this import of 46,306 tons as the actual average annual shortage as between production and consumption. They considered that the increase in population would indicate an increased demand of approximately 3,500 tons of sugar per annum. At the same time expansion in the existing mills and the possible erection of mills by private enterprise was not lost sight of, nor the fact of variable seasons, although this factor to-day with the much greater production north of Townsville is not of so much importance.

Allowing for such factors the Commission recommended that two mills should be erected for the crushing season of 1913 and one for the year 1914, and that the consideration of the erection of additional mills

be thereafter reviewed as necessity arose and in the light of their final recommendations as to sites. After reviewing the different sites inspected, the Commission recommended that the two mills to be erected for 1913 should be one of 10,000 tons and one of 5,000 tons sugar capacity. The larger of these mills should be erected at Babinda Creek, Russell River, and the smaller mill at Daradgee, Johnstone River.

In considering the proposal to erect a mill at Jarvisfield, near Ayr, the Commission reported favourably, but Mr. J. Drysdale, of the Pioneer Mill, in giving evidence stated a verbal agreement between himself and the Government existed whereby he was to erect a mill on the Inkerman Estate, and he further stated that he intended building this mill, not only to met the requirements of the Inkerman lands but to take surplus cane from the Pioneer and Kalamia mills. The Commission therefore recommended that if before 31st December, 1911, no definite assurance had been received by the Government that a sugar-mill was to be established at Inkerman, the number of mills to be erected for the 1913 season should be three, the third mill of 5,000 tons capacity to be built at Jarvisfield, Burdekin River.

Continuing with their recommendations the Commission advised that for the season 1914 a mill of 8,000 tons sugar capacity be erected on the south branch of the Johnstone River, and that the subject of the further erection of central mills should be allowed to remain open to review by the Treasurer from time to time. If further new mills were decided upon, the Commission put the sites for same in the following order:—

> Freshwater (Cairns), Liverpool Creek, Tully River, Long Pocket (Ingham), Bailey Creek, Hamilton (Mackay), Silent Grove (Mackay), Aloomba (Cairns), and Don River (Bowen).

The Commission further recommended under the provisions of "*The Licensing Act of* 1885," section 22, the prohibition of the issue of new licenses for the sale of liquor within the area for proposed new mills.

The outcome of the Commission's Report was the passing of an Act in October, 1911, to authorise the construction and establishment of sugar works by means of moneys advanced by the State and to provide for the repayment of such moneys, and for the maintenance, management, and control of such sugar works and for other purposes connected therewith. This Act was known as "*The Sugar Works Act of* 1911," and it was under this Act that the Babinda and South Johnstone sugar-mills were erected by the Queensland Government. The Act provided for a system of Cane Credits, being a percentage of the price paid by the Corporation of the Treasurer to suppliers of cane as the Corporation considered to fairly represent money appropriated towards the repayment to the Treasurer of the loan with interest, and also provided for rates on owners and occupiers of land within a sugar-works area to meet any annual deficiency. The sale of intoxicating liquor in a sugar-works area (i.e., a sugar-works area created under the Act) was declared to be unlawful.

The recommendation that two mills be erected for 1913 was not carried out in that year. The Daradgee proposition eventually dropped out. Messrs. Drysdale Brothers, however, erected the Inkerman Sugar Mill in 1913-14, and its first crushing took place in 1914 with a crop of 62,052 tons of cane. Due to the severe drought in the Lower Burdekin district in 1915 the Inkerman Mill did not crush that season.

In 1913 the Cairns-Babinda supporters of the mill project were getting restive. A number of growers had opened up land at Babinda and were already growing cane. From the Babinda area about that time growers representing some 480 acres were sending their cane to Mulgrave, and those representing 1,017 acres were forwarding cane to the Colonial Sugar Refining Company's mill at Hambledon. There were also areas that had been planted which were too far from Mulgrave and Hambledon to render the harvesting profitable, and in addition a number of small areas were under cane for the purpose of providing plants. Arrangements were made in April of 1913 by the Premier, Mr. Denham, to visit Babinda, where he met the Provisional Committee and a large number of those interested in the project. Most impassioned speeches were made, notably by the late A. J. Draper and G. R. Mayers, and also by Dr. Reed, who were all at that time considerably interested in the Babinda lands. Certain statements had been laid before the Government before the meeting took place, and the Premier stated that if the evidence as to areas, &c., were substantiated the next step would be to call tenders for the erection of the mill. The duty of verifying the statements was put in the hands of the writer who, with Mr. R. Wilson, now Assistant Under Secretary to the Department of Agriculture and Stock, rode around the lands interviewing the canegrowers, and the facts elicited were that the estimated area under cane closely approximated that set out by the Provisional Committee.

Later in the year tenders were called for the erection of the Babinda Mill, the successful contractors being Messrs. George Fletcher and Company, of Derby, United Kingdom. During 1914 the land was cleared for the mill site and the building partly erected, it being intended to commence crushing in 1915.

Tenders were also called for the sister mill to be erected in the South Johnstone area, and the same firm were successful in getting this contract also. This mill was to be ready to crush in 1916. Scrub clearing was commenced and farms were being taken up for the opening of the mill.

The Babinda Mill was ready for crushing during the 1915 season and got to work, although it was not finished by the date set out in the contract. This was due principally to the war and the difficulty of procuring materials necessary for the completion of the works. It was a very dry season in 1915 and there were numerous cane fires which, according to one exaggerated statement, boiled all the fish in the Russell River, but which did considerably hamper manufacture, and there were at times serious delays owing to accidents to the machinery, so that serious deterioration in the cane set in before it could be treated. As the season progressed, however, many difficulties were overcome. The first crop was naturally a small one, amounting to only 47,014 tons of cane. The sugar manufactured at 94 n.t. being 5,209 tons. The following year, 1916, however, saw much improved conditions all round, and Babinda's crop was 154,630 tons, and since that date it has always had large tonnages of cane to deal with. The contractors did not hand over the mill till after the completion of the first crushing. Meantime, the erection of the South Johnstone Central Mill had been commenced and was being proceeded with in 1915. At the end of the year owing to the war the delivery of machinery was delayed and progress much retarded. It was, however, hoped that the mill would be equipped and ready to commence crushing about the end of September, 1916. The tramway work at South Johnstone was of very solid character, caused by the country through which it was necessary to go for cane.

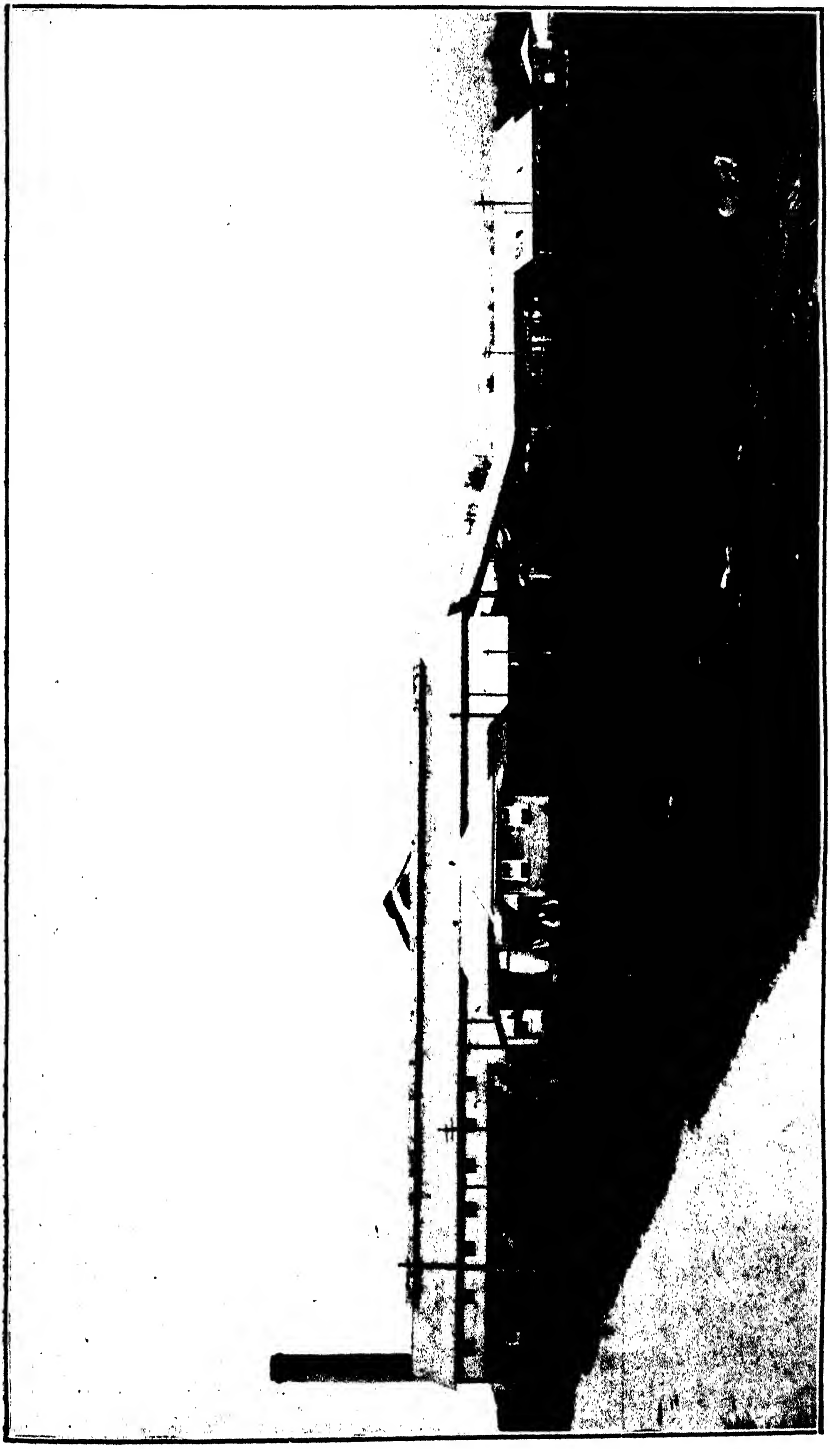


Plate 48.—Babinda Central Sugar Mill.

The mill was due to be completed in July, 1916, but it was not complete in October of that year. A start was made at the end of October and a crop of 56,205 tons of cane was put through the rollers. A good deal of the sugar introduced could not be recovered owing to the requisite appliances not being available, and the financial loss caused thereby was considerable. It was recognised, however, that the farmers were not responsible for the war conditions and that their crops must be removed. The crushing did not terminate till February of 1917 when 4,653 tons of 94 n.t. sugar had been manufactured. It took 12·07 tons of cane to make one ton of sugar. Next year, 1917, the crop was 81,584 tons. A loss was made on the first two seasons' operations, which naturally created much anxiety. Unfortunately, the following year (1918) a disastrous cyclone caused great damage to this mill, not only were buildings wrecked but there was loss of life and the farmers suffered severely, houses as well as crops being more or less damaged. In consequence, the tonnage of cane fell this year to 57,106 tons. The outlook at South Johnstone therefore in the early years of its history was most distressing, but in a few years the difficulties were surmounted and big crops have been handled during recent years. The erected of these two mills had a wonderful effect in opening up unpopulated country. Where impenetrable jungle once reigned there are now mills, townships, farm houses, schools, hospitals, libraries, post offices, telephone exchanges, and railways—in fact all the adjuncts of civilisation.

In a history of this kind it is necesary after following out different lines of activities to have to return to a previous period. We may therefore go back to 1912 when the first Federal Royal Commission concluded its sittings and presented its report. This was the most voluminous document ever printed in connection with the Australian sugar industry. Evidence was taken from 447 persons, and the printed volume ran into 1,146 foolscap pages. The findings were not quite unanimous, four of the members presenting a majority report, while a dissentient memorandum was furnished by Mr. T. Crawford, one of the members. The reference to the Commission embraced the following subjects:—

(*a*) Growers of sugar and beet;
(*b*) Manufacturers of raw and refined sugar;
(*c*) Workers employed in the sugar industry;
(*d*) Purchasers and consumers of sugar;
(*e*) Costs, profits, wages, and prices;
(*f*) The operations of the existing laws of the Commonwealth affecting the sugar industry; and
(*g*) Any Commonwealth legislation relating to the sugar industry which the Commission thinks expedient.

The Chairman of the Commission was first Sir John Gordon, and on his retirement through ill-health William Jethro Brown. The other members were Albert Hinchcliffe, M.L.C., R. M'C. Anderson, M. R. M. Shannon, and T. W. Crawford. The Commission entered on its duties on 25th October, 1911, held 139 sittings, and presented its report in December, 1912. In the conduct of their investigations and in the framing of their report they assumed:—

(1) A loyal adherence to the policy of a "White" Australia.
(2) The natural importance from the point of view of defence of effecting the settlement and cultivation of the tropical and semi-tropical areas of the Australian continent.

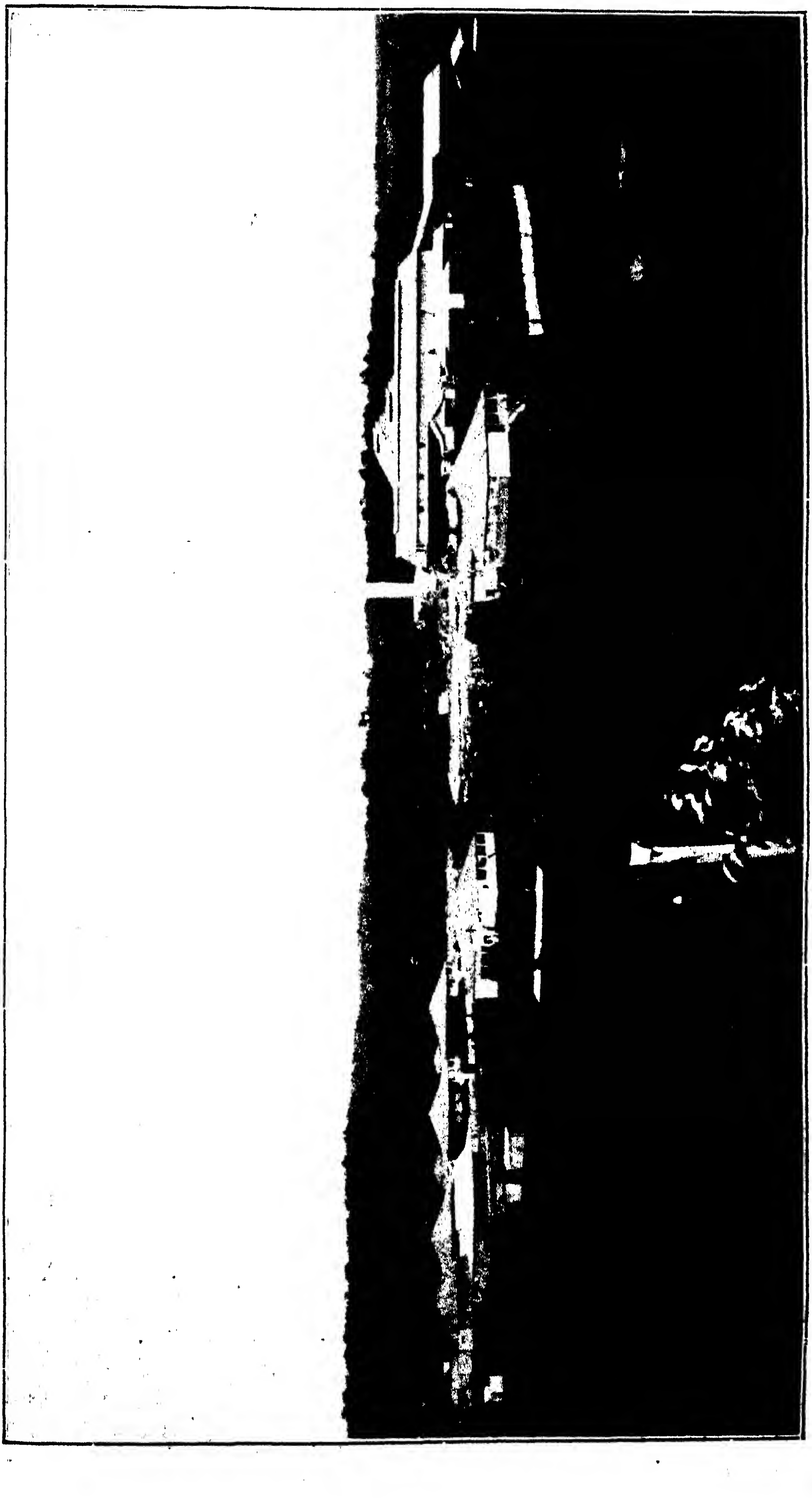


Plate 49.—South Johnstone Central Sugar Mill.

The Commission served a highly useful purpose, and its report was read with intense interest. They took a far-seeing view and to some extent dispelled the clouds of ignorance and prejudice obscuring this important industry; they showed that it was one of national importance, the maintenance of which vitally affected every citizen of the Commonwealth. By no other means could our vast littoral be peopled and defended. The following extracts from their report are worth quoting and are just as vitally applicable to-day:—

> "While the wide divergencies of opinion which exist to-day with respect to the relation of public control to the sugar industry are often the result of mere ignorance of essential data, they are still more frequently the result of the failure to out-grow ideas, opinions, or policies which belong to the limited outlook of pre-Federal times. The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence. No nation can afford to regard lightly the development of its industries, the progres of its wealth, or the economic efficiency of its productive machinery. But, important as these things undoubtedly are, they rank, as regard the sugar industry, on an inferior plane. The Commonwealth to-day is brought face to face with one of the gravest problems which has ever taxed the ingenuity of statesmanship—that of the settlement of tropical and semi-tropical areas by a white population living under standard conditions of life. And, intimately associated with this problem is the question of national defence. If the ideal of a "White" Australia is to become an enduring actuality some means must be discovered of establishing industries within the tropical regions. So long as these regions are unoccupied, they are an invitation to invasion as well as a source of strategic weakness. Granted so much, it follows that the supreme justification for the protection of the sugar industry is the part that the industry has contributed, and will, as we hope, continue to contribute to the problems of the settlement and defence of the Northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the sugar industry. Relatively to it all other issues are of minor importance."

The Commission recognised at that date the possibility of effective settlement by a white population of the Queensland coastal areas. They believed the opposition shown was due to a failure to recognise the physical adaptibility of the white races to varying climatic conditions.

It is not intended to follow the report of the Commission in detail as at the present time many of the questions which were then of importance have been settled or are no longer of any great interest. It was a capable Commission and the industry owes a debt of gratitude to it for its presentation of the facts.

During 1912 the Department of Agriculture sent the late Mr. T. H. Wells to New Guinea to collect sugar-cane varieties, and 158 were forwarded to the Mackay Sugar Experiment Station. Those were secured by Mr. Wells in the face of considerable difficulties from the mountainous regions of Papua. Unfortunately, after long trials, none of those varieties were found to be as good as three or four of the earlier collection by Mr. H. Tryon, though Mr. Wells was not responsible for this, as he had no way of testing canes but simply chose them on appearance.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

FIELD DAYS.

It has been the policy of the Bureau of Sugar Experiment Stations for many years past, to conduct Annual Field Days at each of the Experiment Stations, at South Johnstone, Mackay, and Bundaberg. In this way it has been possible to bring before the notice of attending growers and others interested in the industry the nature of the work which the Bureau is undertaking, and a demonstration of the results obtained.

Whilst realising the shortcomings of this field day system, the policy was continued until last year, but it has now been decided that the Experiment Station field days shall be discontinued. This may possibly meet with disfavour from sections of canegrowers who were happily situated with respect to an Experiment Station, but it is felt that a careful consideration of the plan which will be substituted for the old one, will go further towards the achievement of the full aim and object of a field day, and will exceed in usefulness and popularity those hitherto conducted at the Stations.

The interest shown in our annual gatherings of the past is evidenced by the numbers attending these functions. Last year, record numbers attended field days at all three Stations, and at Mackay the number present approximated 1,000. The difficulties which attend the efforts of the Bureau officers in their attempt to address such large gatherings, or to meet individual growers is very evident. For this reason it is desirable that the numbers attending a group field day should be greatly reduced; and the plan must be to increase the number of field days, and meet smaller groups of growers on each occasion. The Bureau will hold, then, district field days—a district consisting of the area supplying cane to one mill, or of an area which produces portions of the crop of several mills, but where soil and general agricultural conditions are similar.

The inauguration of such a scheme has been made possible by the recent addition to the personnel of the agricultural staff of the Bureau, and the decentralisation of the experimental work which is rapidly being pushed ahead. Last year marked the institution of extensive farm experimental trials, to determine the effects of fertiliser treatments, to compare the relative values of a series of cane varieties, or the resistance of new and old varieties to major cane diseases. These plots have been set out over a wide range of soil and climatic conditions, and each year their numbers will be increased.

The results gathered from these tests should be of greater direct value to growers than the results of Station experiments; for they are performed under farm conditions, on soils representative of the types on which the results will be applied directly. It is obviously futile for a grower to visit, say, the Bundaberg Station, study the fertiliser response there, and hope to obtain similar results from identical treatments on, say, the alluvial soils of the Maroochy, or even the Burnett River. Similar remarks will apply to methods of land preparation and cultivation; for a different set of conditions might render the methods employed on one soil type, under its peculiar climatic conditions, totally unsuited to a different type with its attendant problems.

Field days will, then, be conducted along lines somewhat similar to those which were followed at Bli Bli (Nambour) last year. This field day was conducted by the local farmers' committee, and the success of the project was such that the event is to be repeated enthusiastically a few weeks hence.

A plan which might prove suitable for a mill district field day would be along the following lines:—The local committee (or executive) would fix a day which is agreeable to the majority of growers, as well as the place of assembly. Officers of the Bureau representing the various agricultural divisions would be in attendance, and proceed with the party over a carefully arranged itinerary. It might be thought desirable to make a tour of inspection of fertility or varietal trials located within the mill area, and the points of value which are evidenced by the different treatments (or varieties) discussed. The extent to which the results of the trial are applicable throughout the area might be emphasised and the limitation of their application also stressed.

A practical study of the soil type from the point of view of its cultivation needs and physical peculiarities could be undertaken profitably. On an agreed farm a demonstration of suitable and improved implements could be arranged with the manufacturers and distributors of farm implements, in the same way as they have been at the Stations in the past.

Addresses on the important cane diseases and pests might also be given by the Bureau's officers. In districts favourably situated with respect to Experiment Stations, the latter might be visited if there be any demonstration of value to be seen. The smaller number of growers in the party will make it possible to encourage discussions on the various points raised, regarding all phases of agricultural work, and the personal touch between the grower and the officers will be fostered.

The advantages attending such a field day will be evident. It provides an opportunity for the officers to meet growers under their own conditions, and discuss with them their problems and the methods by which their difficulties may be met. It may not be possible to arrange field days of this nature during this year, but the wishes of growers will be met, as far as possible, in this respect. Farmers may rest assured that the officers of the Bureau will do their part in making the function one of value and interest.

In conclusion, it should be clearly understood that this is not an attempt to keep interested growers from visiting the Experiment Stations. On the contrary, visits will be welcomed from all interested in the work, either individually or in groups, and the Bureau takes this opportunity of inviting more growers to visit the Stations, when the officers will be ever ready to conduct them around and give information on subjects of interest.

CANE PESTS AND DISEASES.

The Director of Sugar Experimental Stations, Mr. H. T. Easterby, has received the following report (24th July, 1930) from Mr. J. H. Buzacott, Assistant Entomologist:—

NOTES ON THE GIANT TERMITE.

A period of five weeks spent in the Burdekin district during May and June this year disclosed some interesting facts relative to the life-history of the Giant Termite, *Mastotermes darwiniensis* Frogg.

A great number of stumps and logs infested by the pest were examined, and finally the search was rewarded in the finding of quantities of eggs. These eggs were discovered in a rotten stump, which, on being pushed, broke off level with the ground, and proved to contain almost a solid mass of termites. At ground level where the fracture occurred, there were seen attached to the earthy matrix of the internal nest, numerous groups of brown eggs, and one individual termite somewhat larger than the normal worker and quite distinct in that it was of a rich dark-brown colour with a creamy-yellow venter. This termite appeared to be actually ovipositing when first observed, but it is not possible to say definitely that it was, and although kept alive in a tin for nearly a fortnight it never oviposited therein. Thus the actual laying of the eggs still remains somewhat obscure, although it seems possible that they may be laid by a modified type of worker such as that described, particularly as Mastotermes is known to be a primitive genus.

The eggs are elongate, about .05 inch in length, of a uniform brown colour, and attached by one pole in groups of twelve to twenty-four. The units in each group appear usually to be arranged in two parallel rows and are bound together throughout their length by some sticky substance, which seems to be provided from the mouth of the worker. On the nest being opened, the workers immediately proceed to carry away the egg masses and reattach them to the nest matrix in a more secluded tunnel of the nest. On hatching from the egg, the young feed on fungi growing on the matrix where the eggs are deposited until they are capable of going out to forage with the adults.

In a nest of Mastotermes the following types can be seen:—Workers (one caste), soldiers (one caste), alate forms (winged), and nymphs of the three types. During May, however, neither alate individuals nor their nymphs showing wing pads are present. In August the latter are to be found, but the fully developed wing-bearers do not appear till October, and they usually fly in December or January. The number of soldiers present is always small compared with those occurring in other species, and although moderately agressive, the soldier does not rush to the spot when an attack is made on the nest like those of Eutermes and other species do. The soldier is provided with powerful mandibles which it is not slow to use, and, on breaking a nest, soldiers will sometimes be observed carrying the young nymphs away in their mandibles.

It is a common practice among termites to eat the bodies of their dead, and this fact is the keynote of success in using arsenicals or stomach poisons as a means of destroying nests. As far as can be determined this does not take place in Mastotermes. The dead bodies of their fellows will be collected and carried to a

disused tunnel and there left in a heap to become covered with mould. Whether the termites make any use of the mould which freely flourishes in the burial grounds is hard to state.

There are several insects which are always found in the nests of Mastotermes. The larva of a small slate-grey moth, huge larvæ of the scarabæid Xylotrupes and other smaller scarabæid grubs are found feeding on the earth and digested wood matrix of the colony. A small silver fish is common, and large centipedes and millipedes often found, the centipedes feeding on the inmates of the nest.

Many species of ants are predaceous on the termites, and if a nest be broken open most of the denizens are quickly carried off by ants, particularly *Iridomyrmex* and *Camponotus*, although several smaller genera, *Pheidole*, for instance, also do good work.

A nest may not extend more than a few inches into the ground or it may go down for several feet, and from the nest small galleries radiate through which the insects communicate with such food as small trees, sugar-cane, or other growing crops, which may be several chains away from the nest. The termites enter the cane or plant by a small hole and eat out the contents of the stick, leaving only the thin rind without external evidence of injury, until the growing point of the plant is reached, when the heart leaves die.

Practically all timbers are subject to attack by Mastotermes, but some are more resistant than others, and chief of these is Gidgee, which, on that account, is much in demand for fence posts in the Burdekin district. Leichhardt, Moreton Bay Ash, and the Black Palm are particularly susceptible, even whilst growing, to attack.

Recommended Methods of Control.

At the outset it should be stated that *Mastotermes darwiniensis* is far more difficult to control than the smaller species of termites. One of the chief reasons for this is that it does not show any sign of a mound or termitarium above ground where it nests, and every post, stump, or even tree may possibly harbour a colony. There is no means of telling without actually digging whether a tree or stump which is attacked actually harbours a nest or is communicated with from a nest located perhaps several chains away. Another factor which renders them difficult to exterminate is the fact referred to above that they appear non-cannibalistic in habit, thus greatly reducing the value of arsenical poisons as a measure of control.

With regard to buildings, posts set in concrete coming above the surface of the ground and watched to see that the termites do not build a communication gallery over the surface of the concrete is probably the best method to secure against attack. If this is impracticable, all timber used should be coated with a repellent such as creosote oil, or soaked in a 10 per cent. solution of sodium arsenite. If these are not obtainable, then timber soaked in or painted with crank-case drainings from the car or tractor, in which a little arsenic has been dissolved would prove resistant. Wherever a piece of boarding is removed on account of termite attack, the replacing board should be treated as mentioned above, and if the attacked timber cannot be removed, bore some holes into it and squirt in some of the arsenic in oil solution mentioned before.

Sugar-cane plantations suffering damage should first try and clear all timber, stumps, and logs as far as possible from the farm. It should be borne in mind that the termite probably only visits the cane for water. This is borne out by the fact that sugar-cane is always far worse attacked in dry seasons, but at the same time although a certain amount of moisture is necessary, yet an excess of water is one of the best methods of repelling the termite, and further reference will be made to this shortly. Any timber in which a nest is located should be treated by pouring half a pint of carbon bisulphide or a couple of pints of benzine into it and blocking all openings. This treatment will kill most of the inmates of the nest, and if carried out systematically will greatly lessen the pest. Baits consisting of arsenic and molasses in the proportion of 1 lb. to 50 lb. may be poured into nests and are successful, but this treatment should be varied, as after a while the termites seem to get cunning and will not take the baits.

Fence posts are very frequently the source of infection of a farm, and, where possible, the substitution of steel posts as supplied by some Southern firms would be profitable. If wooden posts must be used and Gidgee cannot be obtained, then they should be soaked in 10 per cent. sodium arsenite solution and well creosoted or tarred before putting in the ground.

As regards the cane itself, nothing is more effective than frequent heavy watering of the cane, a course which is quite practicable in the Burdekin district where irrigation is universal. This method of control has been found most effective in

controlling certain South African termites which ravage plantations, and has also been found to give good results in Queensland. Usually one side or a corner of a block shows heavier damage than the rest of the block, and when this is the case a furrow could be ploughed along the headland between the cane and its source of infestation, and in this furrow a bait consisting of bran or sawdust mixed with a little molasses or treacle and water into a mash and then some white arsenic stirred into it should be distributed, and the furrow covered over. Approximately, 1 lb. of the poison is required for 50 lb. of bait. Cane sticks containing termites should be treated with one of the above baits, by breaking off the top of the stick and pouring some of the bait down the tube disclosed.

Planting should be carried out with the ground as moist as possible, or it should be well watered after planting in order to keep the termites from attacking the young shoots, and thus causing a bad strike. Nests may be destroyed if no fumigants are available by well breaking into them, thus allowing access for their enemies, the ants, which will quickly carry off every exposed termite.

In conclusion, the termite or "White Ant," *Mastotermes darwiniensis* Fr., although not presenting a major problem like the cane grub, is steadily spreading, and even if not becoming more intense, it is affecting more farms than a few years ago. It is far better for growers to make an organised effort to control a pest while it still remains fairly easily controllable, than to let it increase its depredations until eventually it reaches such numbers as to require a great deal of time, labour, and money to eradicate it.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Special Report, dealing with experimental work carried out during the period May to June, 1930, against insects of the genus Pseudococcus; and which deals with the discovery of a cheap and effective method of combating our mealy bug of sugar-cane, from the Entomologist at Meringa, Mr. E. Jarvis.

A NEW AND EFFECTIVE SPRAY FOR MEALY BUGS.

Most canegrowers and other agriculturists have experienced the persistent aggressiveness of these small, soft-bodied, pinkish insects which are dusted over or covered more or less thickly with white powder or flocculent filaments of a waxy nature. Being gregarious in habit they are usually met with in small colonies, consisting of from fifty to hundreds or thousands of individuals of all sizes, from the tiny larval to adult forms, the latter being generally less than one-eighth of an inch long. In the Cairns district mealy bugs commonly infest the granadilla, passion fruit, and many other creepers, proving particularly obnoxious also to such ornamental shrubs as Acalyphas, Ixoras, Coleus, Crotons, &c. The tropical fruit trees most badly attacked appear to be the Sour-sop and Custard Apples, the fruit being sometimes so grossly infested as to appear white instead of green. (See accompanying plate.)

In canefields these bugs congregate under the older leaf-sheaths in masses, and being thus screened from view their presence usually remains unnoticed.

Notes on Remedial Measures.

Owing to the waxy secretion already alluded to affording a defence against insecticidal sprays, the control of mealy bugs has always proved a somewhat difficult matter; seeing that such protective covering must first be dissolved in order that the bodies of the insects may be thoroughly wetted with the solution used. Moreover, many of the species have an objectionable habit of nestling as far as possible out of sight around the softer shoots and basal portions of the leaf-stalks of affected plants, in positions which can only be reached by the careful application of driving mist-sprays.

Amongst the many different remedies recorded as being more or less effective against insects of the genus *Pseudococcus* the following substances may be mentioned here, viz.:—Kerosene and soap emulsions, resin compounds, carbolic acid, nicotine, lime sulphur, oleic acid, oil emulsions, &c.

Recent experimentation carried out by the present writer at Meringa Sugar Experiment Station has aimed at the discovery of a formula which, in addition to being inexpensive and simple to prepare, shall be composed of materials obtainable at all times from every country store or grocer shop.

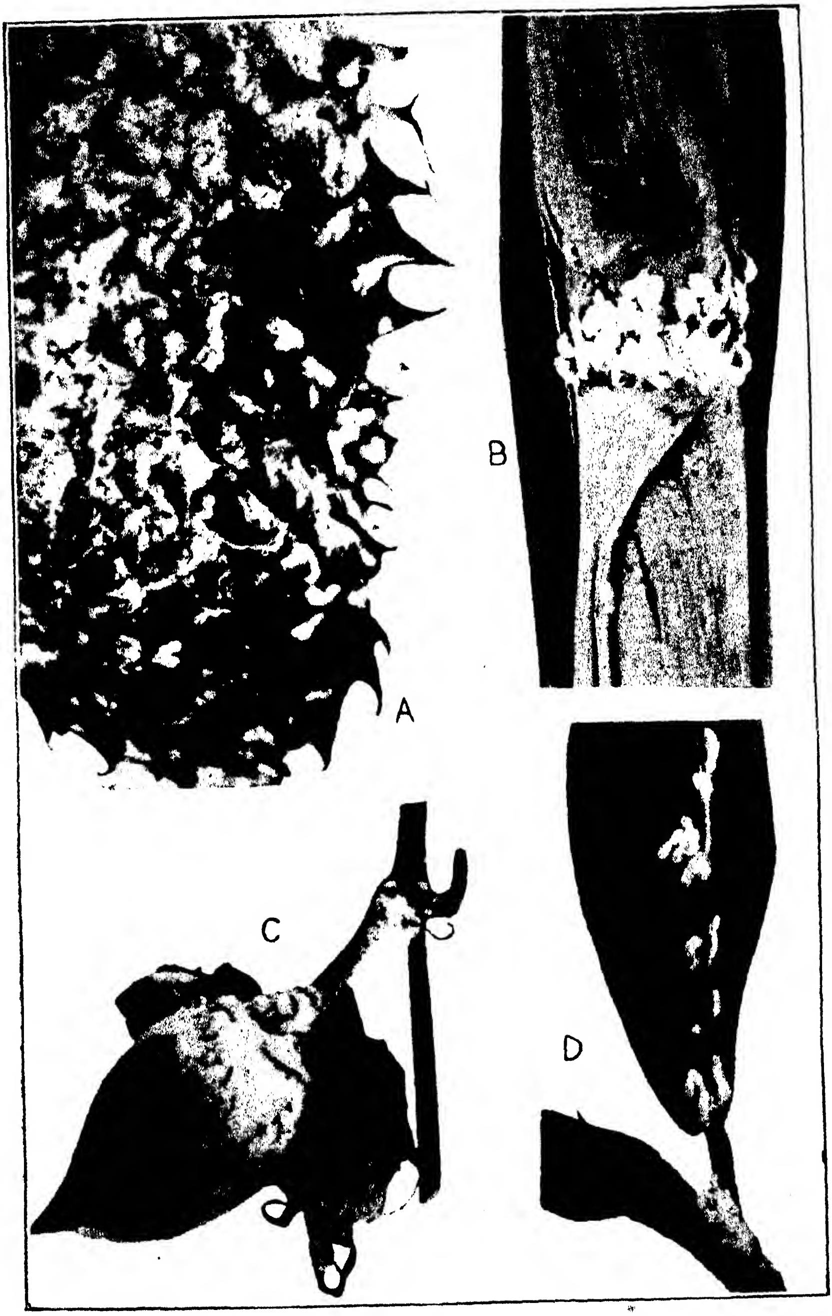


PLATE 50.

A. Part of Sour Sop fruit infested by Mealy Bugs. Natural size.
B. Mealy Bugs attacking stick of sugar cane. Natural size.
C. Cotton Boll, infested by Mealy Bugs. Natural size.
D. Mealy Bugs on leaf of *Ficus pilosa*. Natural size.

Attention was accordingly concentrated on such substances as caustic soda, kerosene, soap, resin, and tobacco, used either one with another, or in various combinations; my desire being to make a stock solution of firm consistency, calculated to keep well in the tropics and be always ready for use at a moment's notice.

Preliminary experiments with resin and washing soda compound are proving satisfactory, a soap emulsion containing kerosene and caustic soda was tried and found promising. This latter spray killed about 75 per cent. of adults, 100 per cent. of tiny larvæ, and all eggs that chanced to be fully exposed. Tender foliage was not injured by the solution.

Two different emulsions were then prepared on 21st May, one containing tobacco extract and kerosene, the other crude carbolic and tobacco, in proportions thought likely to combine well. This carbolic acid spray destroyed from 25 to 30 per cent. of adult mealy bugs, together with all the young larval forms; the ants in attendance on them being also killed.

Another emulsion containing caustic soda and kerosene proved fatal to about 95 per cent. of adults, and 100 per cent. of young bugs that chanced to be fully exposed to the spray.

As a result of experiments with the emulsions alluded to above, and a few additional preparations which need not be described here, it was found that maximum mortality was obtained from a combination of soap, kerosene, and tobacco.

This emulsion, which destroys practically 100 per cent. of adults, young, and eggs of this pest, including attendant ants, will now be given in detail below. The table indicates concisely the amounts of material required for making various quantities of the stock-solution.

SIMPLE AND EFFECTIVE SPRAY FOR MEALY BUGS.

Soap "Witch" bar	10 oz.	1¼ lb.	2½ lb.
Kerosene ("Laurel" brand) ..	1 pint	2 pints	2 quarts
Tobacco (black plug)	2 oz.	4 oz.	½ lb.
Rain water	3 pints	3 quarts	1½ galls.
Amount of stock-emulsion	4 pints	4 quarts	2 galls.
Total quantity of spray, if using 6 parts water to 1 part stock-emulsion	3½ galls.	7 galls.	14 galls.

The cost of three gallons of spray solution works out at about 1s. 8d. for material, exclusive of spray-pump or labour, &c. Needless to say, this amount of spray, when applied in mist form, goes a long way.

How to Make the Stock-Emulsion.

Cut 10 oz. of the soap into thin shavings, dissolve same in 2 pints of boiling water and strain through wire gauze. While still very hot pour slowly into this the pint of kerosene, and then the 2 oz. of tobacco extract, stirring all the time. The latter ingredient (the strong, black sort favoured by seamen and our aboriginals) is quickly prepared by tearing the plug into flakes of leaves and stems which are then boiled for about twenty minutes in the other pint of water; the resultant nearly black fluid being then strained while still quite hot through closely woven linen before adding to the kerosene-soap mixture. During cooling of the finished emulsion it must be stirred vigorously for some minutes and then poured from one vessel to another in such manner as to impart a churning motion until lukewarm.

At this stage it starts to thicken and should then be stirred well until ready to pour into tins or jars, as such final agitation ensures a good, uniform emulsification of the tobacco extract. This stock-emulsion sets after a few hours, attaining a consistency resembling that of frozen butter, and being light chocolate in colour. To prepare a spray for immediate use, melt the amount of stock-emulsion required (according to the number of insects to be treated) over a slow fire, and when quite liquified add six parts of water to one part by fluid measurement of the stock emulsion. Allow this to stand on the stove until reaching a temperature of about 50 deg. C. (just hot enough to be able to hold one's finger in). Apply at once, through a nozzle throwing a misty spray with good force, holding end of same within a few inches of the mealy bugs in order to wet them thoroughly.

Always strain the made-up spray when filling your pump, as this will avoid trouble with atomising nozzles.

When heating either the stock-emulsion or spray be careful to see that it does not boil, or even reach a scalding temperature.

The Spray Does Not Injure Plant Life.

During the testing of this emulsion on different species of mealy bugs attacking cane, cotton, figs, Acalyphas, Ipomea, Beaumontia, &c., the various solutions used were always applied at the same time (while quite hot) to leaves of sweet-potato, tomato, passion fruit, strawberry, papaw, and other foliage; as well as to tender seedlings of cabbage, turnip, beetroot, carrot, &c.

It is satisfactory to be able to record that in no cases did such spraying result in material injury to any plants so treated.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period June to July, 1930, from the Entomologist at Meringa, Mr. E. Jarvis:—

An Erroneous Impression Contradicted.

Among the various remedial measures against cane grubs investigated during recent years there is one which, although proved conclusively to be worthless, still appears to find advocates among certain farmers in our sugar-growing districts.

It is high time that this old delusion concerning the supposed value of white arsenic as a remedy for cane-grubs was fully exposed, seeing that even at the present time there are growers in the Burdekin and elsewhere who continue to be foolish enough to waste their time by using a method which can only result in disappointment and financial loss.

I wish, therefore, to emphasise the fact that although white arsenic might prove serviceable under field conditions if employed in the form of a poison-bait (see Bulletin No. 4, Div. of Ent. Bur. S. Expt. Stns., 1916), it is quite useless to expect to get beneficial results by merely sprinkling or otherwise burying it amongst the roots of sugar-cane.

Dr. Illingworth commenced his experiments with this arsenical in the year 1918, carrying them on throughout a period of about three years, most of his experiment plots being situated on the Greenhills Estate. Some of the methods of application tried during this period were:—

(1) White arsenic placed in drills on sprouting plants,

(2) White arsenic placed under the stools of cane,

(3) White arsenic placed with the sets.

Negative Results with White Arsenic Against Cane Grubs.

Data filed at our Experiment Station giving results obtained on field plots established at Greenhills by Dr. Illingworth in 1921 (about a couple of months before he left Queensland) show that on 23rd March, at the time of year when grubs were doing the greatest damage, no difference was apparent between plots treated with 100 lb. and those which had received 200 lb. of white arsenic per acre. The cane on Block H2 was found to be uniformly grub-infested, no difference being observable between that which had been treated with this poison and cane in the untreated check plots.

Results obtained by digging up the cane stools on these test plots were as follows:—A stool dug in the 100 lb. arsenic plot yielded seven grubs, while another examined in the untreated check plot alongside gave two grubs. Again, a stool dug up in the 200 lb. arsenic plot yielded thirteen grubs, while another stool on the check plot alongside revealed eleven grubs. Thus, it so happened that a final examination of these experiment plots revealed, curiously enough, the presence of more grubs under the stools which had been treated with white arsenic than chanced to occur on the plot which had been left untreated alongside. No dead grubs were obtained from beneath any of the treated or check stools on this H2 block.

The result of this investigation made at Greenhills on 23rd March showed conclusively that as many grubs occurred under cane on land which had been poisoned at the rate of 100 to 200 lb. of white arsenic per acre, as under cane which had not been treated.

Biological Control Work.

At the present time the life history of one of our rare species of digger wasps named *Scolia formosa* Guer. is being studied. This species was first recorded by the present writer in 1923, who succeeded in breeding a specimen captured at Gordonvale, from which twenty-four eggs were obtained. These were all deposited on grubs of our greyback cane bettle, and ultimately yielded eleven cocoons; the wasp, however, refusing to oviposit on grubs of the small brown cockchafer *Lepidiota frenchi* Blkb.

Scolia formosa is about the size of our common digger wasp *Campsomeris tasmaniensis* Sauss., its black abdomen being ornamented with broad bands of rich orange-red; while the head, thorax, and legs are densely clothed with reddish hairs. The present specimen, which was also captured in a flower garden at Gordonvale, has already laid, to date, thirty-one eggs on grubs of the greyback cockchafer. Data of an interesting nature relative to the effect of changes of temperature on the duration of its various life-cycle stages is being recorded from day to day.

The wasps derived from eggs of this insect, being now obtained here, will be welcome additions to our office collection; especially the male specimens, only one of which was secured from my 1920 breeding of this digger wasp.

Visit to the Lower Burdekin District.

During May and June the Assistant Entomologist, Mr. J. H. Buzacott, paid a visit to Ayr, our principal object being to carry out further investigation regarding the habits, metamorphosis, and various methods of controlling the ravages of the "Giant Termite" (*Mastotermes darwiniensis* Frogg.

In the opinion of Mr. Buzacott, the damage caused by this termite is gradually spreading, although "there does not," he remarks, "appear to be any increase in concentration of the pest. The spread is quite local, and cane is being attacked only on farms which are adjacent to those formerly suffering damage." "Grubs," he reports, "have caused damage on several farms near Ayr and considerable damage at Giru, especially along the banks of the Haughton River. The Burdekin Pest Destruction Board paid out nearly £2,000 for greyback beetles collecting from the feeding trees during the flighting season this year.

"The only other pest causing appreciable damage in the district is the bud moth, *Opogona glycyphaga* Meyr., which is badly damaging the eyes of certain canes. Although this moth is usually quite common it rarely reaches the status of a serious pest, but it was certainly killing sufficient eyes to cause a poor strike, and should warrant investigation."

INSECT FRIENDS OF THE CANEGROWER.

ENTOMOLOGIST'S ADVICE FOR AUGUST.

By EDMUND JARVIS.

While ploughing cane land one constantly unearths and exposes to view various forms of insect life, mostly representive of the commoner species of scarabæidæ, familiarly known as cane beetles.

Although growers are, of course, perfectly aware that these abovementioned grubs should be destroyed as far as possible, they understand very little about the habits of other soil-frequenting insects often occurring in the furrow, some of which, being parasites of cane grubs should always be carefully protected.

Chief of these is a sleek-looking, plump, shining white maggot about an inch in length, which is generally found attached to a dead or dying cane grub. This maggot if left in the soil ultimately spins a cocoon of closely woven silk of a reddish-brown colour and the stiffness of brown paper.

About a couple of months later a handsome wasp parasite emerges from this cocoon and digs its way to the surface.

Each of these wasps is able to destroy over a hundred grubs, and breeds at the rate of at least four generations a year.

Other friendly insects include the predaceous larva of a skip-jack or elaterid beetle; and the larva or maggot of a common species of "robber-fly," both of which live in the ground and tunnel about in search of various cane grubs.

The former resembles a large flattened wire worm, about 2 to 4 inches long, while the maggot of the robber-fly has a sharply-pointed beak and exceeds an inch in length.

Hints to Field Assistants.

The activities of the Supervisor in our cane fields may be said to embrace a rather wide range of work, calling, as it does, for a practical knowledge of agriculture, combined with an aptitude for experimental research of a scientific nature; together with a dash of originality and plenty of common sense.

Being on the spot, as it were, he can generally get leave from growers to conduct various experiments on their farms, and is always at hand to supervise the carrying out of same. He is also in a good position to suggest any improvements that may chance to occur to him regarding routine methods of farm cultivation which might facilitate the operation of, or render more effective certain lines of control work against cane grubs or other insect pests.

Another important service which could be performed by the Field Supervisor would be the recording of data in connection with cane varieties, insects, pathological diseases, fertilisers, &c., which come under his notice from day to day.

Such details are always of interest, and should be of future assistance to those concerned, or engaged in studying the control of insects and fungus diseases.

In the work of field experiments or plots designed to test the efficiency or otherwise of insecticides or soil-fumigants, the Supervisor has the best possible chance of securing that harmonious co-operation with the farmer concerned, which certainly goes far towards ensuring the carrying through of such experiments in the best manner.

BUREAU OF SUGAR EXPERIMENT STATIONS.

In recent years the Bureau of Sugar Experiment Stations has made considerable advances in the direction of affording more help to growers and millers. With the return of the travelling scholars, Messrs. Kerr, Bell, and Bennett, it was possible to reorganise the work of the Bureau, which is now divided into four sections, viz.:—

1. *Soils and Agriculture.*—This comprises Sugar Experiment Stations in the Southern, Central, and Northern sugar districts, and an extension service employing field officers located throughout the cane areas, who keep in close touch with cane growers. Numerous experiment trials with cane are established in all sugar localities.

2. *Sugar-cane Pathology.*—Officers employed in the field and laboratory are studying cane diseases and their control.

3. *Entomology.*—Entomologists are maintained at selected locations so as to deal effectively with the study and control of the most important cane pests.

4. *Sugar Mill Technology.*—The Technologist and his staff investigates mill problems and the various phases of sugar extraction and manufacture.

The organisation of the Bureau covers the several branches of growth and manufacture in a manner unique amongst the primary industries of Australia. The funds for its maintenance are contributed equally by the industry and the Government.

The Laboratories of the Divisions of Soils, Agriculture, and Pathology are situated at Brisbane and have just been completed. They are thoroughly up to date and include all the latest apparatus for scientific work. Sugar growers and millers visiting Brisbane are especially invited to call and see the work being carried out in these laboratories, which are situated in the Department of Agriculture's building, in William street. Here investigations and research work in chemistry and physics of our sugar-cane soils, and into the diseases of cane, are being conducted.

New laboratories have also been fitted up at the Mackay Sugar Experiment Station for the work of sugar mill technology. It is hoped to give the mills a considerable amount of scientific assistance in the future, and to help to solve some of their many problems.

The work of the recently formed Queensland Society of Sugar-cane Technologists, it is anticipated, will also have a great effect in improving the sugar industry, and bring it more in line with the world's best practices.

So far from having to increase the levy on sugar mills and growers for the carrying out of this new work and the enlargement of the staff, the Bureau has been able this year by careful management to reduce same from 1d. to ½d. per ton of cane.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART II.

TEMPERATURE REACTIONS.

THE cutworm under study is given to sudden and sporadic outbreaks of great severity, and whatever the direct causes of such outbreaks may be, it is the weather which is the ultimate cause of the variation in incidence.

A complete analysis of the factors operating in this connection would be well-nigh impossible, but within certain limits the habits of the cutworm itself reduce that number. As an example of this, it is found that the action of direct wind currents is mostly eliminated by the burrowing habit of the larvæ. Living and feeding amongst an abundance of succulent food counteract the effect of low-atmospheric humidity to a great extent.[2] Resting during the day under cover of food plants and buried in the ground reduces the effect of direct sunlight and allows the larva to burrow towards moisture if it requires to do so. The pupa in its earthen cell is also sheltered from many vicissitudes.

The temperature of its surroundings controls the growth rate of the larva to a great extent, and indeed this can be said of all stages of the life history. If the growth rate in relation to temperature is known, it is possible to predict with considerable accuracy, the time at which different stages will be reached and when recurrence of attacks may be expected.

A knowledge of the temperature relations of *Dysdercus sidæ*[3] gained while assisting in some work on that insect enabled one to go into the field with an accurate knowledge of the stage in which the insects would be found. A study of the temperature relations of all stages of *Euxoa radians* was undertaken with a view to getting a working knowledge of the length of each life stage at different temperatures.

A short résumé of some of the work done on the temperature relations of insects might not be out of place here.

Resume of Some Previous Work.

Abbé (1878) published his work on the thermal constant of locust eggs.

Sanderson (1908) defined the thermal constant as "The accumulation of mean daily temperature, above a critical point for the species, causing it to issue from hibernation or change instars." This is the "temperature summing" which was used by American entomologists in predicting the emergence from hibernation of the boll weevil.

Weissman (1882), working on the seasonal dimorphism of a butterfly, was able to show that if the summer form were cooled down slowly and then warmed up again, it could be made to emerge in October in the winter form. If, however, it were kept at a warm temperature without being cooled down, it would pass the winter before emerging. The cooling down was necessary for the normal development of the winter form. It will thus be seen that the life stage of this insect had a direct effect, apart altogether from its normal reaction to temperature.

Merriam (1894) published the "Laws of Temperature Control of the Geographical Distribution of Temperate Plants and Animals." In that work it is stated that "Animals and plants are restricted in northward distribution by the total quantity of heat, that is to say, the sum total of mean daily temperature above 43 deg. Fahr. during the season of growth and reproduction." The temperature 43 deg. Fahr. was regarded as the temperature below which no perceptible growth occurred. This is the temperature summing principle already mentioned.

Howard (1895) published his work on the temperature relations of household insects, and later showed that the distribution of the yellow fever mosquito (*Aëdes aegypti* L.) was controlled by temperature. A knowledge of its temperature requirements would enable one to predict its behaviour and spread, in districts where it might be accidentally introduced.

Chittenden (1899) showed how low winter temperatures might be effective in preventing the spread of insects to new areas.

Bachmetjew (1901-1902), working on the relation of temperature to insect activity, found that for every insect a definite range of temperatures exists, between the extremes of which the insect is active. At a temperature known as the "optimum," activity is at its greatest. A raising or lowering of the temperature away from the "optimum" lowers the rate or metabolism. At a certain high temperature above the "optimum" activity ceases and metabolism is almost at a standstill, death ensuing in time if the high temperature is maintained. A still higher temperature exists (at which death is instantaneous), and this can be called the "upper thermal death point." A low temperature exists at which activity ceases, metabolism is extremely slow, and a state which can be called "hibernation quiescence" ensues. At a low temperature, the "critical point," the internal heat of the insect suddenly rises, but if cooling is continued the temperature again falls to the "critical point" and death follows.

Sanderson (1905, 1908, 1910) shows how species are restricted to life zones by temperature. He shows the relation existing between temperature and hibernation, and in "The relation of temperature to insect growth" suggests that by keeping a series of insects at constant temperatures a graph can be built up, showing the relation of each insect to the whole range of temperatures to which it may be submitted.

Instead of the "temperature summing" above the developmental zero, he suggests that the percentage of time required to complete each stage at the different temperatures be used as units.

Cotton (1908) used his knowledge of the temperatures required to hatch the eggs of the Southern Cattle Tick to mark out areas which would be safe from infection at different periods of the year.

The "Bioclimatic Law" of Hopkins gives a practical application of the response of insects to temperature.

The combined effect of humidity and temperature has been investigated by various writers, and a great variation in the tolerance to wide ranges of humidity is found in different species. Headlee (1914) investigated the effect of temperature and humidity on the rate of insect development, and Pierce (1916) published a graphical figure showing the effect of a range of temperatures and humidities on the life functions of the boll weevil. Shelford (1926) produced a graphical representation of the effect of combined temperatures and relative humidities in common animals of temperate latitudes.

In this connection it is well to reiterate that Headlee (1914)[2] found that "The rate of metabolism in certain actively feeding insects with abundance of succulent food available is not affected by large differences in atmospheric humidity." These conditions obtain in the Queensland experiments with *Euxoa radians* larvæ, and appear to give a like result, within certain limits.

In some cases it has been found that the temperature reactions of insects vary with the different seasonal generations of the insects under study.

A recent development of temperature work has been published by W. C. Cook.[4] He submitted numbers of cutworms of the species *Porosagrotis orthogonia* and *Chorizagrotis auxiliaris* to varying numbers of hours at high temperatures, alternating with the remainder of the day at a constant low temperature of 8 deg. C. He found that the growth rate per hour at the high temperature when alternating with the low, was greater than the growth rate per hour at a constant high temperature. For the species examined eight hours at the high temperature of 32 deg. C. alternating with sixteen hours at 8 deg. C. gave the greatest growth rate per hour.

From his data in those experiments, Cook (loc. cit.) constructed a solid model with time and temperature as his horizontal axes and growth rate as his vertical axis. The rate of metabolism or growth may be predicted on this model for any time-temperature combination.

Shelford[5] states that development under fluctuating temperatures is 1·02 to 1·08 times as fast as under constant temperatures.

In the constant temperature experiments, to be described later, this matter of fluctuating temperatures in the field must be borne in mind. In practice the half-daily observations used in these experiments over the length of time taken to pass through each instar, would introduce a possible experimental error as great, or in some cases greater than the error due to constant temperature. Field and laboratory controls have been kept, and the results of these are incorporated in the graphs, to show the variation between the time of development at constant, as contrasted with fluctuating temperatures.

Co-ordination of Field and Laboratory Work.

At the Cotton Research Farm, Biloela, a complete set of meteorological records is kept. For entomological use a continually recording thermometer gives the temperatures at a depth of about 1 inch in the ground and under cover of such vegetation as the caterpillars may be using from time to time. This gives a good idea of the temperatures to which the caterpillars or pupæ in the soil are being subjected at any time of the year.

It is found that under cover at a depth of 1 inch to 2 inches in the soil, the daily rise and fall of temperature moves about a mean which is very nearly the true mean of the daily maximum and minimum temperatures.

At such a depth under good cover the daily mean is not far different from the mean daily shade temperature of the air, although not so subject to sudden rises or falls. After the ground has warmed up in summer, however, this soil mean is consistently higher than the shade mean during dry weather. During a dry spring cutworms are frequently found in situations where vegetation is sparse.

Well cultivated fields with cotton seedlings newly through the ground provide such situations. In such cases the heat of the sun during the day raises the surface soil temperatures up to high figures and, where shade is absent, eggs may be destroyed by the heat, while it is also possible that a day of extremely high temperature may destroy pupæ in exposed situations where cover has been removed. On such a day, soil temperature in a place where there was no cover has risen in October, at 2 inches depth to a value of 129·5 deg. Fahr.

In the case of the caterpillars, however, although exposed at times, and for short periods to temperatures of over 100 deg. Fahr., they can always seek cover, and no case has been observed where they have been killed by the direct action of the sun's heat.

These data from the field, coupled with the results of laboratory temperature experiments, help in gaining a good idea of the rate of development, or stage of life history, and activity of the various insects under observation. In the case of *Euxoa radians* field and laboratory experiments were carried out bearing on its rate of growth at different temperatures, and the laboratory technique will now be dealt with.

LABORATORY TECHNIQUE.

In these experiments groups of eggs, larvæ and pupæ were subjected to a range of constant temperatures to determine the duration of each life stage at different temperatures.

A multiple temperature incubator (Model 3) made to the specification of C. B. Williams and T. W. Kirkpatrick,[6] Egypt, was used.

The heat in this case was supplied by an electric bulb with carbon filaments. Each lid covered a compartment in which there was placed a maximum and minimum recording thermometer. Although the temperature in each compartment kept fairly constant, yet the outside temperature and the amount of ice in the ice box, together with possible variations in the electric current, caused some variation which was recorded half-daily on the thermometer. A range of fairly constant temperatures from about 46 deg. Fahr. at the cold end to about 120 deg. Fahr. at the hot end of the incubator was obtained.

A few typical records from different parts of the incubator are given in Table IV. and will serve to show the range of temperatures from which the means were derived.

Pupa.

The pupal instar was first dealt with and for this purpose large numbers of larvæ were collected in the field. They were placed in jars with half an inch of sifted soil into which they could burrow. The jars were open at the top to allow free passage of air. Pigweed (*Portulaca oleraceæ*) was supplied to the larvæ for food, this plant being used throughout the experiments as the standard food for all stages of the larvæ. The larvæ were examined twice daily so that they could be transferred at once to the incubator when they pupated. The size and sex of the pupæ were noted in all cases.

In order to keep soil humidity nearly equal throughout the series of temperatures, the soil in which the pupæ lay was kept moist. Moistening had to be done frequently in the warm compartments and seldom in the cold ones. Each pupa was placed in a 2-ounce glass jar on sifted soil, the jar having a number etched into it, the lid not being used so that air circulated freely.

When emergence of the adult moth was seen to be imminent, by the darkening of the pupa, a plug of cotton wool was placed in the mouth of the jar to prevent escape of the moth. A piece of stiff cardboard was leant across the jar from top to bottom so that the emerging moth could cling to its under surface to unfold its wings.

Egg.

These were placed in glass jars in groups of twenty. In the hot compartments some moistening was done to prevent desiccation. Hatching was watched for, and the larvæ supplied with food and covered over to prevent escape.

Larval Instars.

While small, the larvæ were put into jars in batches of ten, and fed on pigweed. A very little soil was given at first, the quantity increasing with size. New food was given daily and the soil frequently changed to keep conditions hygienic. Uniformity of humidity was not possible in the different compartments, but the soil in each was kept slightly moist to maintain uniformity as far as possible.

Owing to the high mortality of cutworm larvæ large numbers were necessary in each series. Much difficulty was experienced in finding the head capsules from the moults, so individual larvæ were isolated for the purpose. The larvæ seemed to do better in groups until they were nearly full grown, when they did well separately. In order to get a reliable indication of the average time taken to complete a stage, three methods were used:—(1) Single larvæ were isolated and their moults observed and noted; (2) Groups of larvæ were kept together and the first individual to moult to the following instar noted, and the last, for each succeeding stage; (3) Groups of larvæ individually noted were averaged as to their moulting times.

A certain amount of compensation was noticed in healthy broods, for, when certain individuals took abnormally long to go through one or two instars, they tended to shorten the later ones. In this way the variation in pupation dates was relatively less than the variation in the dates of passing from the earlier to later larval instars.

The larvæ were found to thrive best when sifted soil and plant debris were present for them to shelter in and this added to the difficulty of observation.

In the groups of larvæ the moults were observed by the light colour of the head capsule and skin of the newly moulted larvæ, the individuals not newly moulted being much darker in colour.

In the incubator the larvæ were kept in darkness so that there was a possibility that this might affect the rate of development. To check this a group of newly hatched larvæ was divided in two. One lot of larvæ was kept in the laboratory in a jar freely exposed to the light, while the other lot was placed in a similar jar but wrapped round with brown paper to exclude light completely. A slightly faster rate of growth was observed on the part of the cutworms reared in the dark, but the difference noted was not great. Table III.

Experiments were also carried out with series of larvæ as near field conditions as possible, so that their rate of development could be compared with that of the larvæ in the incubator, subjected to a constant temperature.

Adult.

On emergence from pupation the moths were placed in pairs (male and female) in large glass jars with cheese-cloth covers.

In the field eggs were laid in the loose soil under low-spreading vegetation. In jars without soil, moths laid under compulsion, but laid more freely when loose soil was sprinkled over the bottom, and plants of pigweed laid on top of it. The eggs were found laid on the glass bottom of the jar, so firmly cemented on that they could not be removed without bursting.

It was necessary to get the eggs on some movable medium to be used in the incubator, so the following expedient was adopted. A false bottom of brown paper was placed in the jar and soil sprinkled over it. The eggs were found each morning firmly cemented to the brown paper, which could be lifted out, the eggs counted, and the paper cut up into pieces having any desired number of eggs adhering.

The moths were fed on sugar solution, honey solution, or fresh flowers were given them to feed from. Each pair was removed to a freshly prepared jar daily, and the old one searched for eggs. Besides being laid through the loose soil on the brown paper, eggs were often found on the pigweed leaves. In one case where water had been spilt over the bottom of the par, soaking the soil, the female laid her eggs on the cheese-cloth cover of the jar.

RESULTS OF TEMPERATURE WORK.

In setting out the results of the temperature work the graphical method of representing the data has been used wherever possible. Where graphs are not suitable the results are tabulated.

In the following table is found the results of the experiment to compare the rate of development in cutworms exposed to normal daylight, with those kept in darkness, all other conditions being as nearly as possible equal.

Fifty first instar larvæ were used in Series 1, thirty in Series 2, but only those which reached pupation are recorded in the Table.

TABLE III.—Egg Hatching to Pupation in Light and in Darkness.

Series 1.

——	Darkness.	Light.	Average Temperature.
1	47 days	40 days	23·8 deg. C.
2	37 days	41 days	23·8 deg. C.
3	40 days	46 days	23·8 deg. C.
4	41 days	39 days	23·8 deg. C.
Averages ..	41·25 days	41·5 days	..

Series 2.

——	Darkness.	Light.	Average Temperature.
1	32 days	34 days	25·5 deg. C.
2	33 days	33 days	25·5 deg. C.
Averages ..	32·5 days	33·5 days	..

The numbers surviving are too small to do more than indicate a probability, but the larger numbers of ordinary laboratory and field observations can be compared with the incubator numbers for further confirmation.

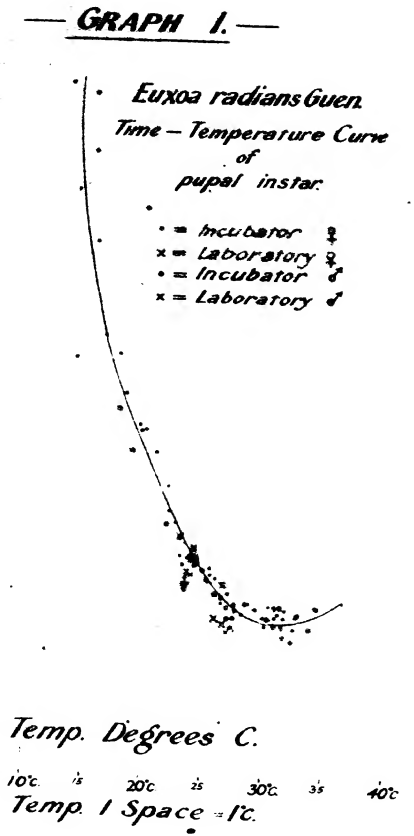
The results of the work with the pupæ will be reviewed first, as this instar was more intensively observed than the others, owing to its interest in the field as the stage which survives severe winter weather.

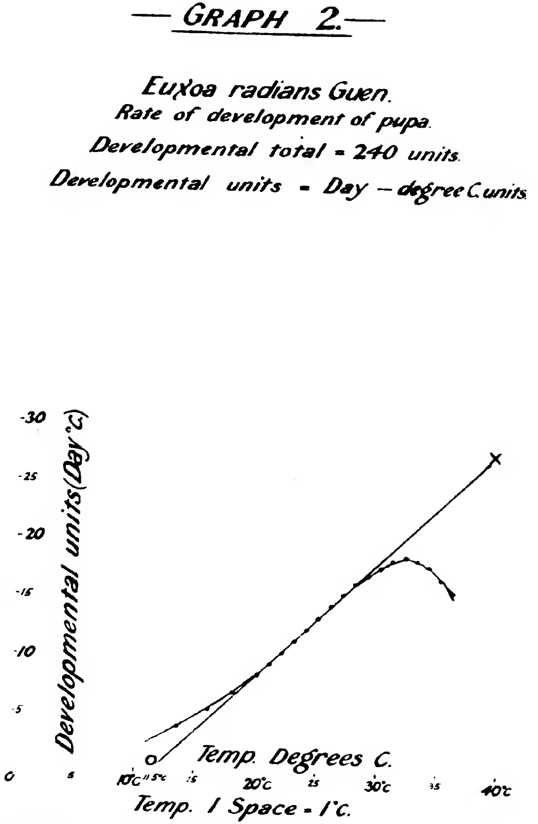
A few typical temperature records taken from the hot end, the middle, and the cool end of the incubator will show the daily range of temperatures obtaining within the compartments of the incubator used. The fact that there is a fluctuation in temperature makes it impossible to call the work strictly constant temperature work, but the range is too small to cause any marked change of growth rate due to such fluctuation.

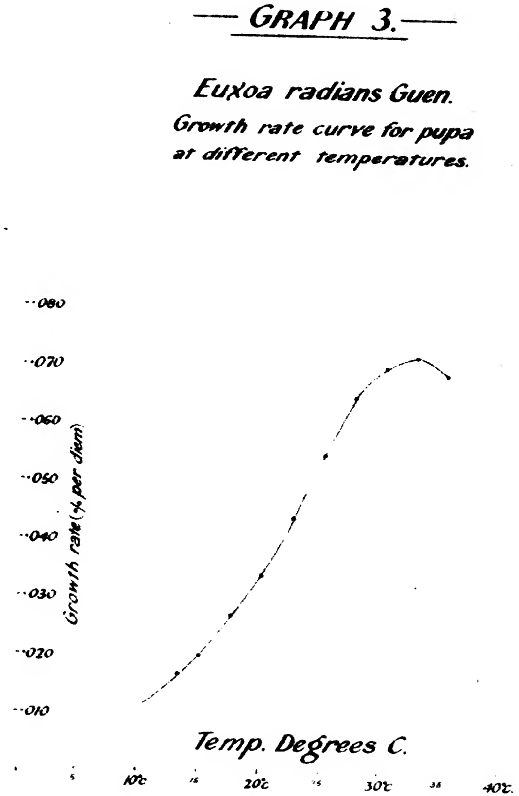
TABLE IV.

TYPICAL TEMPERATURE RECORDS ON LIFE SHEETS OF PUPÆ IN INCUBATOR.

COMPARTMENT (3).			COMPARTMENT (12).			COMPARTMENT (19).		
Length 19·5 mm. ♀ pupa. Pupated 12 noon, 29 Dec., 1927			Length 20 mm. ♀ pupa. Pupated 7-8 Dec., 1927.			Length 19 mm. ♂ pupa. Pupated 4-5 Dec., 1927.		
Date.	Max. °F.	Min. ° F.	Date.	Max. °F.	Min. ° F.	Date.	Max. °F.	Min. ° F.
1927.			1927.			1927.		
29 Dec. ..	94	90	8 Dec. ..	78	76	5 Dec. ..	76	68
30 Dec. ..	97	91	9 Dec. ..	77	74	6 Dec. ..	73	68
31 Dec. ..	98	91	10 Dec. ..	78	74	7 Dec. ..	71	65
1928.			11 Dec. ..	79	76	8 Dec. ..	68	65
1 Jan. ..	99	94	12 Dec. ..	77	75	9 Dec. ..	68	65
2 Jan. ..	98	90	13 Dec. ..	77	74	10 Dec. ..	68	64
3 Jan. ..	92	88	14 Dec. ..	77	74	11 Dec. ..	70	66
4 Jan. ..	94	90	15 Dec. ..	78	75	12 Dec. ..	68	65
5 Jan. ..	93	90	16 Dec. ..	80	78	13 Dec. ..	67	65
6 Jan. ..	99	90	17 Dec. ..	78	75	14 Dec. ..	69	65
7 Jan. ..	98	92	18 Dec. ..	77	75	15 Dec. ..	70	66
8 Jan. ..	97	90	19 Dec. ..	78	76	16 Dec. ..	69	64
9 Jan. ..	91	89	20 Dec. ..	79	75	17 Dec. ..	68	65
10 Jan. ..	90	87	21 Dec. ..	77	73	18 Dec. ..	68	66
11 Jan. ..	92	89	22 Dec. ..	77	75	19 Dec. ..	69	66
12 Jan. ..	91	89	23 Dec. ..	78	77	20 Dec. ..	70	66
Emerged adult 12-13 Jan., 1928. Average, Temp. 92·5 deg. Fahr. Time, 14½ days.			24 Dec. ..	75	72	21 Dec. ..	68	65
			25 Dec. ..	72	70	22 Dec. ..	68	64
			26 Dec. ..	78	72	23 Dec. ..	69	65
			Emerged adult, 26-27 Dec., 1927. Average Temp. 76 deg. Fahr. Time, 18-19 days.			24 Dec. ..	65	61
						25 Dec. ..	63	60
						26 Dec. ..	70	63
						27 Dec. ..	71	67
						28 Dec. ..	71	67
						29 Dec. ..	70	66
						30 Dec. ..	71	65
						31 Dec. ..	70	67
						1928.		
						1 Jan. ..	71	69
						2 Jan. ..	71	68
						Emerged adult 3 Jan., 1928. Average Temp. 67·3 deg. Fahr. Time, 29 days.		







Graphs showing rate of development of eggs and larvæ of *Euxoa radians* Guen. in relation to temperature.

Adult.

On emergence from pupation the moths were placed in pairs (male and female) in large glass jars with cheese-cloth covers.

In the field eggs were laid in the loose soil under low-spreading vegetation. In jars without soil, moths laid under compulsion, but laid more freely when loose soil was sprinkled over the bottom, and plants of pigweed laid on top of it. The eggs were found laid on the glass bottom of the jar, so firmly cemented on that they could not be removed without bursting.

It was necessary to get the eggs on some movable medium to be used in the incubator, so the following expedient was adopted. A false bottom of brown paper was placed in the jar and soil sprinkled over it. The eggs were found each morning firmly cemented to the brown paper, which could be lifted out, the eggs counted, and the paper cut up into pieces having any desired number of eggs adhering.

The moths were fed on sugar solution, honey solution, or fresh flowers were given them to feed from. Each pair was removed to a freshly prepared jar daily, and the old one searched for eggs. Besides being laid through the loose soil on the brown paper, eggs were often found on the pigweed leaves. In one case where water had been spilt over the bottom of the par, soaking the soil, the female laid her eggs on the cheese-cloth cover of the jar.

RESULTS OF TEMPERATURE WORK.

In setting out the results of the temperature work the graphical method of representing the data has been used wherever possible. Where graphs are not suitable the results are tabulated.

In the following table is found the results of the experiment to compare the rate of development in cutworms exposed to normal daylight, with those kept in darkness, all other conditions being as nearly as possible equal.

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TABLE III.—EGG HATCHING TO PUPATION IN LIGHT AND IN DARKNESS.

Series 1.

——	Darkness.	Light.	Average Temperature.
1	47 days	40 days	23·8 deg. C.
2	37 days	41 days	23·8 deg. C.
3	40 days	46 days	23·8 deg. C.
4	41 days	39 days	23·8 deg. C.
Averages ..	41·25 days	41·5 days	..

Series 2.

——	Darkness.	Light.	Average Temperature.
1	32 days	34 days	25·5 deg. C.
2	33 days	33 days	25·5 deg. C.
Averages ..	32·5 days	33·5 days	..

The numbers surviving are too small to do more than indicate a probability, but the larger numbers of ordinary laboratory and field observations can be compared with the incubator numbers for further confirmation.

The results of the work with the pupæ will be reviewed first, as this instar was more intensively observed than the others, owing to its interest in the field as the stage which survives severe winter weather.

A few typical temperature records taken from the hot end, the middle, and the cool end of the incubator will show the daily range of temperatures obtaining within the compartments of the incubator used. The fact that there is a fluctuation in temperature makes it impossible to call the work strictly constant temperature work, but the range is too small to cause any marked change of growth rate due to such fluctuation.

TABLE IV.

TYPICAL TEMPERATURE RECORDS ON LIFE SHEETS OF PUPÆ IN INCUBATOR.

COMPARTMENT (3).

Length 19·5 mm. ♀ pupa. Pupated 12 noon, 29 Dec., 1927

Date.	Max. °F.	Min. ° F.
1927.		
29 Dec. ..	94	90
30 Dec. ..	97	91
31 Dec. ..	98	91
1928.		
1 Jan. ..	99	94
2 Jan. ..	98	90
3 Jan. ..	92	88
4 Jan. ..	94	90
5 Jan. ..	93	90
6 Jan. ..	99	90
7 Jan. ..	98	92
8 Jan. ..	97	90
9 Jan. ..	91	89
10 Jan. ..	90	87
11 Jan. ..	92	89
12 Jan. ..	91	89

Emerged adult 12-13 Jan., 1928. Average, Temp. 92·5 deg. Fahr. Time, 14½ days.

COMPARTMENT (12).

Length 20 mm. ♀ pupa. Pupated 7-8 Dec., 1927.

Date.	Max. °F.	Min. ° F.
1927.		
8 Dec. ..	78	76
9 Dec. ..	77	74
10 Dec. ..	78	74
11 Dec. ..	79	76
12 Dec. ..	77	75
13 Dec. ..	77	74
14 Dec. ..	77	74
15 Dec. ..	78	75
16 Dec. ..	80	78
17 Dec. ..	78	75
18 Dec. ..	77	75
19 Dec. ..	78	76
20 Dec. ..	79	75
21 Dec. ..	77	73
22 Dec. ..	77	75
23 Dec. ..	78	77
24 Dec. ..	75	72
25 Dec. ..	72	70
26 Dec. ..	78	72

Emerged adult, 26-27 Dec., 1927. Average Temp. 76 deg. Fahr. Time, 18-19 days.

COMPARTMENT (19).

Length 19 mm. ♂ pupa. Pupated 4-5 Dec., 1927.

Date.	Max. °F.	Min. ° F.
1927.		
5 Dec. ..	76	68
6 Dec. ..	73	68
7 Dec. ..	71	65
8 Dec. ..	68	65
9 Dec. ..	68	65
10 Dec. ..	68	64
11 Dec. ..	70	66
12 Dec. ..	68	65
13 Dec. ..	67	65
14 Dec. ..	69	65
15 Dec. ..	70	66
16 Dec. ..	69	64
17 Dec. ..	68	65
18 Dec. ..	68	66
19 Dec. ..	69	66
20 Dec. ..	70	66
21 Dec. ..	68	65
22 Dec. ..	68	64
23 Dec. ..	69	65
24 Dec. ..	65	61
25 Dec. ..	63	60
26 Dec. ..	70	63
27 Dec. ..	71	67
28 Dec. ..	71	67
29 Dec. ..	70	66
30 Dec. ..	71	65
31 Dec. ..	70	67
1928.		
1 Jan. ..	71	69
2 Jan. ..	71	68

Emerged adult 3 Jan., 1928. Average Temp. 67·3 deg. Fahr. Time, 29 days.

Graph 1 shows the time-temperature curve for the pupal instar. The points marked represent individual pupæ. The curve sketched in is arbitrary, arrived at by averaging times in temperature class groups, and is only included to indicate the general direction of the theoretical curve.*

Graph 2 shows the same set of data used to give the growth rate, or better "development rate," in developmental units. The method is as follows[5]:— The developmental zero, or temperature below which no visible development occurs can be determined for the species from the time-temperature graphs.

For example, this can readily be done by taking two points on the time-temperature curve between 20 deg. C. and 28 deg. C. Time and temperature are multiplied together at the two points, the results subtracted, and the remainder divided by the difference in the number of days between the two points, e.g.:—

Temperature 20 deg. C. × days 28·5 = 570
Temperature 21 deg. C. × days 25·5 = 535
Difference 35
Difference between points in days, 3.
Developmental zero = 11·66 deg. C.

By averaging a number of such results the approximate developmental zero for *Eucoa radians* was found to be 11·5 deg. C. This developmental zero is a theoretical and not a true biological point, as can be seen from the graph.

The developmental zero being established, the temperature summing curve can be proceeded with. The developmental total in day-deg. C. units is got by multiplying the number of days taken to complete a stage at any temperature, by that temperature in deg. C. less 11·5 deg., e.g..—

At 27 deg. C. No. of days = 15·5.
Developmental total = 15·5 × (27 deg. — 11·5)
= 15·5 × 15·5
= 240 day deg. C. units.

The average developmental total in the range 20 deg. C. to 28 deg. C. was found to be near 240 day deg. C. units. By dividing this figure by the number of days taken to complete each stage at any given temperature, a number is obtained which represents the number of developmental units gone through each day at that temperature, e.g.:—

At 20 deg. C. 8·5 units of the total 240 are gone through in one day.

From a series of such points the Graph B. has been built up, and from it can be read off, at any temperature, the daily growth of the pupa in developmental units.

It will be seen that in B. the curve between 20 deg. C. and 28 deg. C. is a straight line, which means that between those limits growth rate and temperature increases proportionately. This straight part of the curve produced to OX is at an angle of 45 deg. to the horizontal so that the reading along both axes is the same for the straight part of the curve, if the point O. or developmental zero, is read as true zero on the horizontal axis.

Above 28 deg. C. and below 20 deg. C. this relation does not hold true. In the former case increase of temperature above 28 deg. C. leads

* In order to arrive at the true position and shape of the curve for the points obtained experimentally, the *curve fitting* may be done by the "Method of Least Squares" as explained by R. Pearl in his "Introduction to Medical Biometry and Statistics," 1927, Chapter XVI., pp. 332-341.

at first to a decrease in the acceleration of the growth rate, and above 32 deg. C. to a retardation in relative growth rate.

Below 20 deg. C. falling temperature tends to cause development to decrease at a lower rate, so that the curve tends to become asymptotic to the temperature axis.

There must be a point in the low temperature range at which development and activity cease, either from the freezing of the "free water"* in the organism or from the cessation of feeding, assimilation, or some other life function.

This point was not determined experimentally in the present experiments, but from the general shape of the curve it would appear to be between 3 deg. C. and 5 deg. C. This being so, the curve cannot become a true asymptote to the temperature axis.

In Graph 3 the data from A. are represented in a growth rate curve. The growth rate is the percentage of total development passed through in any period of time (in this case a day) at any given temperature. It is the reciprocal of the time taken to pass through any one stage of life history of the species; in this case the pupal, e.g.:—

At a temperature of 15 deg. C. it takes 50 days to complete the pupal instar. The reciprocal of time is one-fiftieth and this is represented on the vertical axis as ·02.

The slow growth rate at low temperatures allows the pupa to remain in the ground in the cold winter for a long period, and so pass over in a quiescent state the period when food is not available.

The egg curve in Graph 4 is made up from observations of the hatching time of batches of twenty eggs at different temperatures. Each point on the curve therefore represents twenty individuals. The regularity of distribution of these points is obviously due to the absence of many vicissitudes which assail the other life stages.

The time temperature curves for the six larval instars are shown in Graphs 5, 6, 7, 8, 9, 10, respectively. Each point on 5 represents ten larvæ, on 6 five larvæ, on 7 two larvæ, on 8 two larvæ, and in 9 and 10 one larva.

The curve Graph 11 represents the total larval developmental period —egg hatching to pupation. It was arrived at by summing the data of all the larval instar curves and adding the prepupal stasis. The relative value of this curve can be seen by comparing it with the true points got in the incubator, laboratory, and field for the total larval periods; these points being shown separately on the graph.

Time and temperature, or rather growth rate and temperature, can be treated as two variants and their frequency distribution plotted.

The product-moment method of determining the correlation between two variants is not adapted to curvilinear progression, so that the ordinary time-temperature points cannot be used in this connection. That part of the growth rate curve between 20 deg. C. and 28 deg. C. which has already been seen to be straight can be employed however, the reciprocals of time being used, instead of time in days.

Examination of the data in the light of this mathematical method gives a true measure of the accuracy of the figures relative to complete correlation.

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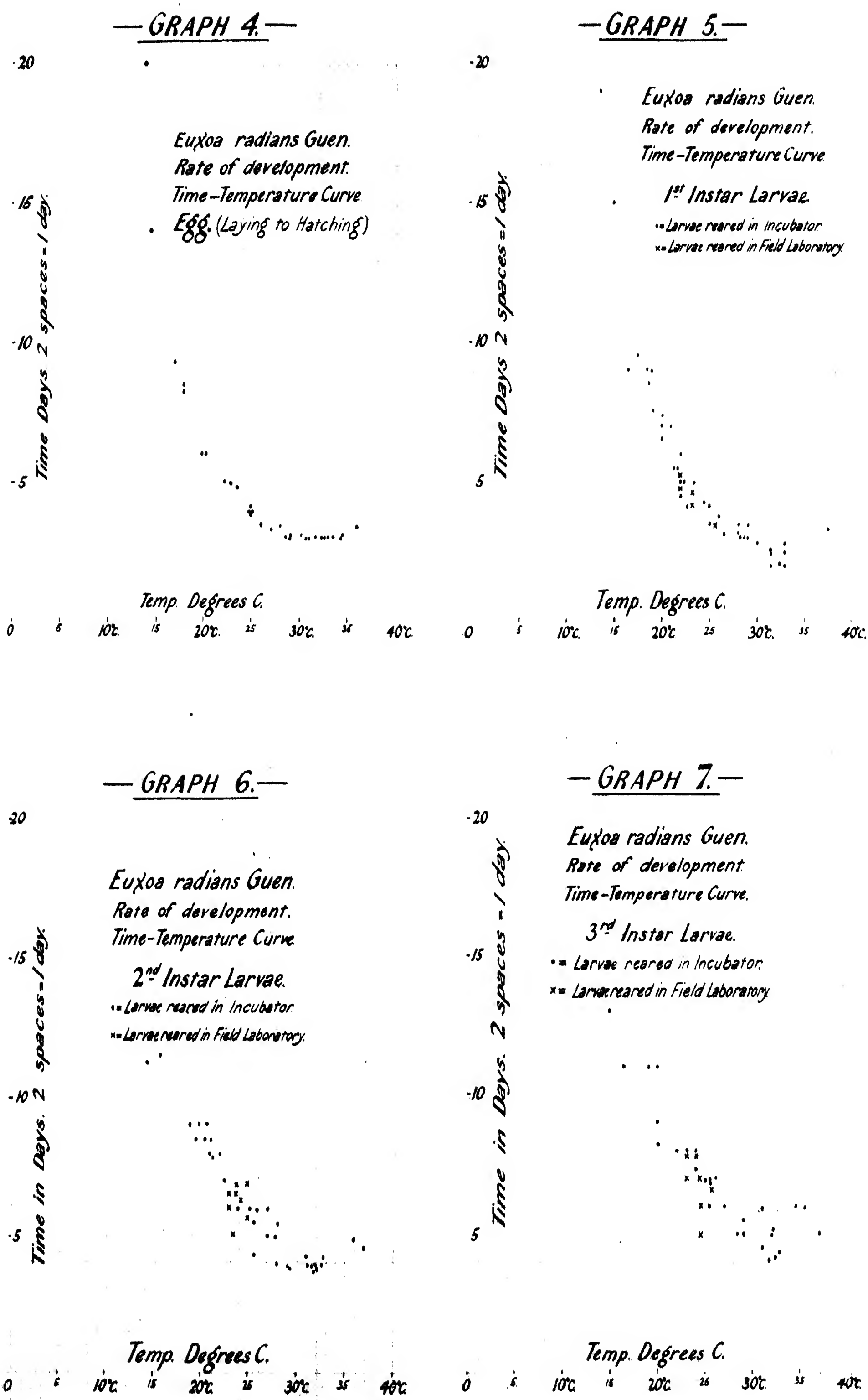
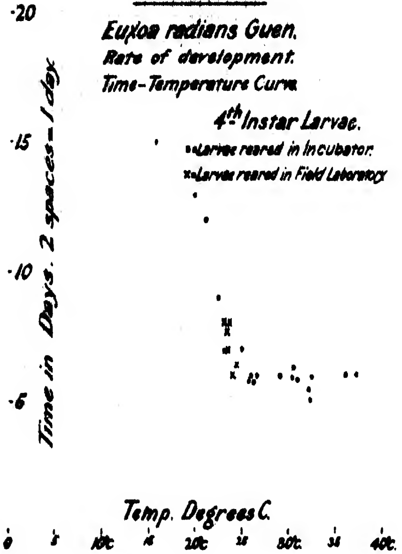
* This "free water" as contrasted with "bound water" is dealt with by W. Robinson in the "Journal of Economic Entomology," vol. 20, No. 1, p. 80. "Water Binding Capacity of Colloids a Definite Factor in Winter Hardiness of Insects."

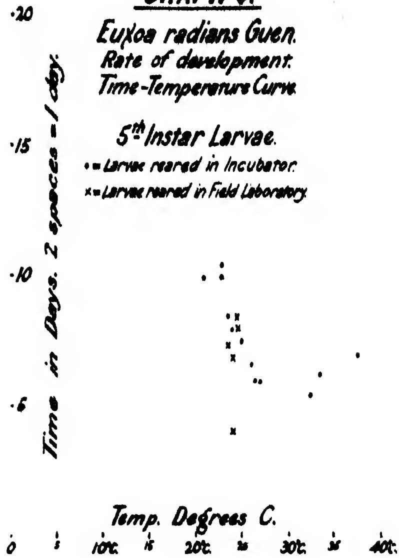


Graphs showing rate of development of eggs and larvæ of *Euxoa radians* Guen. in relation to temperature.

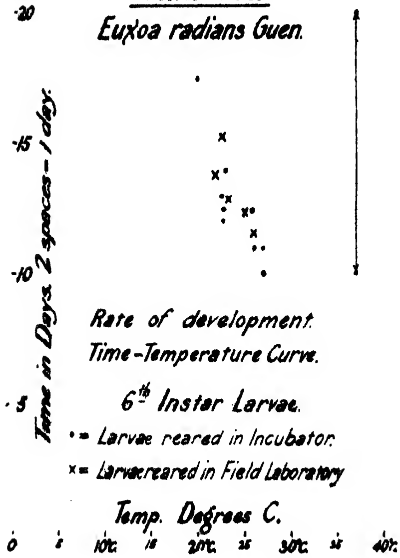
— GRAPH 8. —



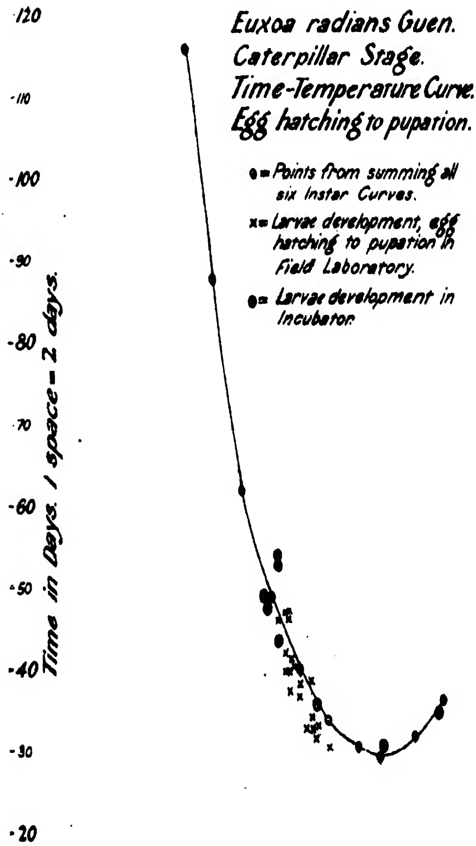
— GRAPH 9. —



— GRAPH 10. —



— GRAPH 11. —



The example given below shows the method used by the plant-breeders Hayes and Garber[7] applied to the data found for the egg of *Euxoa radians.*

Euxo radians Guen. EGG DEVELOPMENTS—LAYING TO HATCHING.

CORRELATION OF DEVELOPMENT RATE AND TEMPERATURE BETWEEN THE TEMPERATURES 19·5° C. AND 28·5° C.

TEMPERATURE CLASSES EACH 1½° C.

DEVELOPMENT RATE CLASSES. Class = ·03 of time taken to complete stage.	1	2	3	4	5	6	fy	$\Sigma(yX)$	$\Sigma(yX^2)$	$\Sigma(XY)$	$y\bar{X} = \Sigma\frac{yX}{fy}$
(·15 – ·18) 1	2						2	2	2	2	1
(·18 – ·21) 2		1	1				2	5	13	10	2·5
(·21 – ·24) 3			1	1			2	7	25	21	3·5
(·24 – ·27) 4				3			3	12	48	48	4
(·27 – ·30) 5					2		2	10	50	50	5
(·30 – ·33) 6						2	2	12	72	72	6
fx	2	1	2	4	2	2	13	48	210	203	22
$\Sigma(xY)$	2	2	5	15	10	12	46				
$\Sigma(xY^2)$	2	4	13	57	50	72	198				
$\Sigma(XY)$	2	4	15	60	50	72	203				

$$\frac{\Sigma(xY)}{n} = \frac{46}{13} = 3{\cdot}54 = \bar{Y}$$

$$\frac{\Sigma(xY^2)}{n} = \frac{198}{13} = 15{\cdot}23$$

$$\frac{\Sigma XY}{n} = \frac{203}{13} = 15{\cdot}6$$

$$\frac{\Sigma(yX)}{n} = \frac{48}{13} = 3{\cdot}7 = \bar{X}.$$

$$\frac{\Sigma(yX^2)}{n} = \frac{210}{13} = 16{\cdot}15,$$

$$\frac{\Sigma(XY)}{n} = \frac{203}{13} = 15{\cdot}6.$$

$$rxy = \frac{\frac{\Sigma(XY)}{n} - \bar{X}\,\bar{Y}}{\sqrt{\frac{\Sigma(yX^2)}{n} - \bar{X}^2}\ \sqrt{\frac{\Sigma(xY^2)}{n} - \bar{Y}^2}}$$

$$rxy = \frac{15{\cdot}6 - 13{\cdot}1}{\sqrt{16{\cdot}5 - 13{\cdot}69}\ \sqrt{15{\cdot}23 - 12{\cdot}53}}$$

$$rxy = \frac{2{\cdot}5}{1{\cdot}64 \times 1{\cdot}67} = \frac{2{\cdot}5}{2{\cdot}7}$$

$$rxy = {\cdot}926 \pm {\cdot}025$$

$$\text{P.E.} = \frac{{\cdot}6745\,(1 - r^2)}{\sqrt{n}} = \frac{{\cdot}091}{3{\cdot}6} = {\cdot}025.$$

In the ideal case where no other factor enters in to affect growth rate, the correlation between growth rate and temperature would be 1 (i.e., 100 per cent.).

In practice it is found that the best correlation is shown where the same number of observations is taken in each temperature class.

In the example it will be seen that the temperature classes are one and a-half degree classes, while the growth rate classes are each ·03 of the total time taken to pass through that life stage.

One of the factors (and one already mentioned) which tends to reduce the correlation ratio between growth rate and temperature is the factor of compensation. An example of that is seen in Graph 9 where a larva took only four days instead of the normal seven to nine days at 24 deg. C. to complete the fifth instar.

The high degree of correlation and the compact form of the graph for the egg and first instar larvæ are not maintained in the later instars. The degree of correlation which nearly approaches "one" in the egg stage slowly falls down as the age of the larvæ increases, the bigger larvæ being open to relatively more disturbance by external, and probably internal influences.

Humidity as a factor appeared to act as follows:—At all "medial" humidities, that is to say, between 30 per cent. and 80 per cent. relative humidity, the correlation between time and temperature seemed unaffected by humidity. When, however, the relative humidity went over 80 per cent. for any period longer than half a day continuously, there was a retardation in the growth rate and an unhealthy condition of the larvæ. If the high humidity continued and the temperature was high, death generally supervened.

This aspect of the subject will be more fully dealt with in the oecological discussion to follow, and examples of humidities causing disease and death are tabulated. (Table VII.)

The following table gives the average time taken by the various stages *of Euxoa radians* to complete those stages at "medial" humidities and in the case of the larval instars, in the presence of unlimited food:—

TABLE V.

AVERAGE TIME IN DAYS TO COMPLETE EACH INSTAR.

Average Temperature.	Egg.	1st instar.	2nd instar.	3rd instar.	4th instar.	5th instar.	6th instar.	Egg hatching to pupation.	Pupal instar.	Egg laying to adult moth.
17 deg. C. ..	9	9½	11	11½	13	14	34	94	36	139
20 deg. C. ..	6¼	7	8½	9	10	10½	17	62	28	96
23 deg. C. ..	4¾	5	6¾	7¼	8	8½	12½	48	20	73
26 deg. C. ..	3½	3¼	5	6	6¼	7	11	38	16	58
29 deg. C. ..	3	2¼	4¼	4¾	5¼	6	10	32½	14½	50
32 deg. C. ..	3	2	3¾	4¼	5	5½	9½	30	13	46

It will be seen that the figures for the sixth instar larvæ include the prepupal stasis and the figures for egg laying to adult moth have been brought to the nearest whole number. The temperature 32 deg. C. is the optimum in the sense of most rapid development for the species, but the use of the word "optimum" in that connection must not be confused with the "optimum" conditions for the survival or increase of the species.

The activities of the imagines were found to be affected by temperature in the same way as the development of the larval stages.

The periods before mating and after mating and before oviposition were found to be increased by low and decreased by high temperatures.

Some of the periods found in the laboratory for female moths are shown in the table:—

TABLE VI.

PERIOD BETWEEN EMERGENCE OF FEMALES AND OVIPOSITION.

No.	Date Emerged Adult.	Average Temperature.	Date of First Laying.	Days—Emergence to First Lay.
	1927.		1927.	
1 ..	6 Dec. ..	22·5 deg. C.	14 Dec. ..	8
2 ..	9 Dec. ..	22·5 deg. C.	16-17 Dec. ..	7-8
3 ..	21 Dec. ..	24·0 deg. C.	28 Dec. ..	7
			1928.	
4 ..	25-26 Dec. ..	24·5 deg. C.	31 Jan. ..	6
5 ..	26 Dec. ..	24·5 deg. C.	2 Jan. ..	6
6 ..	28 Dec. ..	24·5 deg. C.	3 Jan. ..	6
	1928.			
7 ..	30 Jan. ..	26·0 deg. C.	2-3 Feb. ..	3-4
8 ..	3 Feb. ..	26·0 deg. C.	7 Feb. ..	4
9 ..	5 Feb. ..	26·0 deg. C.	8 Feb. ..	3
10 ..	10 Feb. ..	26·6 deg. C.	13 Feb. ..	3
11 ..	29 Jan. ..	26·6 deg. C.	31 Jan., 1 Feb...	2-3

The response by all stages of the life history of *Euxoa radians* to temperature has now been established. Little development takes place at 15 deg. C. and the most rapid rate is found at 32 deg. C., above which temperature there is a decrease in the rate of development. At a continuous temperature of 37 deg. C. all stages of the species succumb after a longer or shorter interval, but death from instantaneous exposure requires a much higher temperature.

DESCRIPTION OF LIFE CYCLE STAGES.

Adult.

(Description extracted from "Catalogue of the *Lepidoptera phalaenæ*," Vol. IV., Brit. Mus. N.H., 1903.)

Plate I., figs. 3 and 4.

Euxoa radians.

"*Agrotis radians* Guen., Noct. i. p. 261 (1852).

Agrotis munda Wlk., x. 348 (1856).

Mamestra basinotata Wlk., xv. 1686 (1858).

Agrotis turbulenta Wlk., xxxii., 703 (1865).

Agrotis injuncta Wlk., xxxii., 703 (1865).

Agrotis scapularis Feld. Reis. Nov., pl. 110. f. 13 (1874).

"Head and thorax reddish brown mixed with white; tegulæ with dark medial line; abdomen pale ochreous suffused with fuscous, the ventral surface whitish irrorated with brown, the anal tuft rufous; tarsi banded with black. Fore wing brown mixed with white especially towards costa, on which is a series of small black spots; the veins with dark streaks, the median nervure and vein 1 defined on each side by white; a curved sub-basal line from costa to sub-median fold, interrupted in cell; a curved double antemedial line between median nervure and vein 1 filled in by whitish; claviform elongate, dark brown defined by black; orbicular and reniform with fuscous centres, whitish annuli and black outline, the former small, elliptical, the latter well developed and with the cell between the stigmata dark brown; the post-medial line very indistinct, minutely waved, bent outwards below costa, excurved to vein 4, then oblique; the terminal area much browner; the subterminal line prominent and white or very indistinct, dentate, with a series of dentate blackish marks before it and streaks in the interspaces beyond it ending in the terminal series of small black lunules; cilia pale, with two fine brown lines through them. Hind wing semihyaline white, the costal and inner areas tinged with ochreous; the veins brownish, the termen suffused with fuscous, narrowing from costa to a point at vein 2; cilia white, fuscous at apex. Underside of fore wing white, with

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PLATE I.

Euxoa radians Guen.

Fig. 1—Eggs attached to leaf .. .. x 20

Fig. 2—Pupa (male) .. .. .. x 2

Fig. 3—Adult male .. .. Natural size

Fig. 4—Adult female .. .. .. Natural size

Fig. 5—Damage to cotton seedling by 1st instar larvæ.

Fig. 6—Damage to cotton seedling by 3rd instar larvæ.

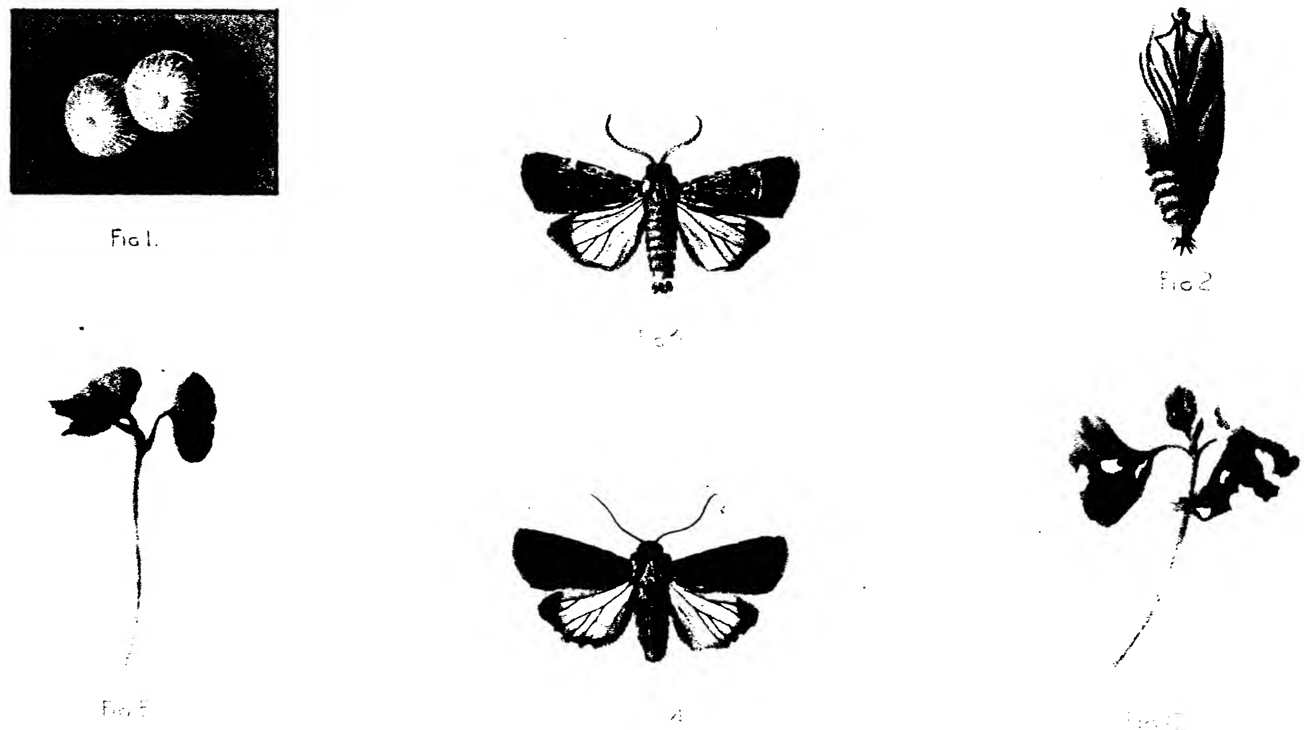


Plate I.—The Brown Cutworm (*Euxoa radians* Guen.)

From Watercolour Drawings by I. W. Helmsing

small discoidal lunule and the terminal area suffused with fuscous; hind wing with rounded apical black patch. ♀ Usually suffused with fuscous, the markings obscure."

The only note to be added to the above description is that the cold weather forms are much more prone to having fuscous markings suffused than the hot weather forms, which are much lighter in general ground colour.

One female recovered in the cold end of the incubator was practically black all over.

Egg.

This is a typical noctuid egg, spheroidal and slightly flattened on one side. (Plate I., fig. 1.) The flattened part may be considered to be attached ventrally to facilitate description. Ridges radiate from the slight protuberance at the tip towards the flattened part. Thickened ridges encircle the egg longitudinally, cutting the radiating ridges at right angles. When newly laid the colour is milk white, but this changes to a light cream as the embryonic development proceeds. A reddish-brown spot then appears at the top, and a band of the same colour forms an equatorial belt round the egg. When about to hatch the dark head capsule and pro-thoracic shield of the larva can be seen through the shell, and the large clubbed setæ on the body can be plainly seen.

The head lies under the apex of the egg, where the micropyle is situated, while the body lies coiled underneath around the periphery.

Average weight	·0022 grams.
Average diameter	·6 mms.

Larval Instars.

In the descriptions which follow the nomenclature adopted by Ripley[8] has been used in the case of the chætotaxy, while he in his turn used the system of Fracker[9] with some additions.

Ripley (*loc. cit.*) considered that the chætotaxy and other features of the head capsule, and the characters of the spinneret, had taxonomic value in the noctuid larva examined by him. In the present bulletin these characters have been featured and the chætotaxy of the body segments marked out. This was done as the author has not yet seen any illustration from the genus "Euxoa" and because certain of the minute setæ which were in doubt have been clearly distinguished in the first instar larvæ and have been figured (Plate III.).

The epicranial index, i.e., the ratio between the length of the frons and the length of the epicranial stem $\frac{F}{ES}$ are given for each instar.

First Instar Larva (Plate II., fig. 1).

Head capsule width **·325 mm.**

Epicranial index $\frac{F}{ES}$ $\frac{\cdot 13}{\cdot 05} = 2{\cdot}6$.

Length **3 to 4 mm.**

Crotchet formula for larvapods $\frac{0}{0}$ $\frac{4}{4}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{8}{8}$

Head capsule colour, dark brown. The chætotaxy of the head capsule is shown in Plate VI., fig. 1. This figure is given to contrast with the figure of the head capsule of the sixth instar larva (Plate VI., fig. 2).

Some outstanding differences between first and sixth instar head capsules apart from mere size are:—

First Instar.	Sixth Instar.
Relatively large setæ, particularly v2.	Setæ relatively small.
Adfrontal suture absent.	Adfrontal suture present.
Ocelli relatively large.	Ocelli relatively smaller.
Epicranial index—2·4.	Epicranial index—4·25.

The chætotaxy of the head of the first instar larva corresponds to the figures in Ripley's work apart from relative position. The only addition in this figure is a small sensorium near ocelli 1 and 2.*

This sensorium has been found in all noctuid larvæ examined and is difficult of observation because of its small size and position. We have named it S.V.4.

All the setæ except the minute ones on the head and body are clubbed, the clubbed ends being hollow. On the sur-anal plate are found the largest setæ, having a length of ·225 mm. and a width at the clubbed end of ·009 mm. The length of setæ α and β = ·16 mm.

There is no visible pigment in the skin of this larva but small protuberances at the base of the setæ are slightly chitinised, the chitin having a faint brown tinge.

The spinneret figured in Plate VII., fig. 3, is of a reduced type.

A general idea of the appearance of the larva is given in Plate V., fig. 5.

The thoracic legs are relatively large and on the first thoracic segment is the dark-brown pro-thoracic shield which is strongly chitinised.

Abdominal segments 1, 2, and 3 carry no larvapods. Those on segments 4 and 5 are very much reduced, while well developed ones are found on segments 6 and 7 and on the anal segment. The crotchet formula, or number of hooks present on each larvapod reading from front to rear is given at the beginning of this description. They are arranged in a uniordinal meso-series. The numbers vary and those quoted only give an example.

* This sensorium was first noticed by the artist, I. W. Helmsing, while drawing the head capsule of *Remigia frugalis*.

Plate II.

Euxoa radians Guen.

Fig. 1—First Instar Larva .. .. × 8

Fig. 2—Second Instar Larva .. .. × 8

Fig. 3—Third Instar Larva .. .. × 4

Fig. 4—Fourth Instar Larva .. .. × 4

Fig. 5—Fifth Instar Larva .. .. × 2½

Fig. 6—Sixth Instar Larva .. .. × 1½

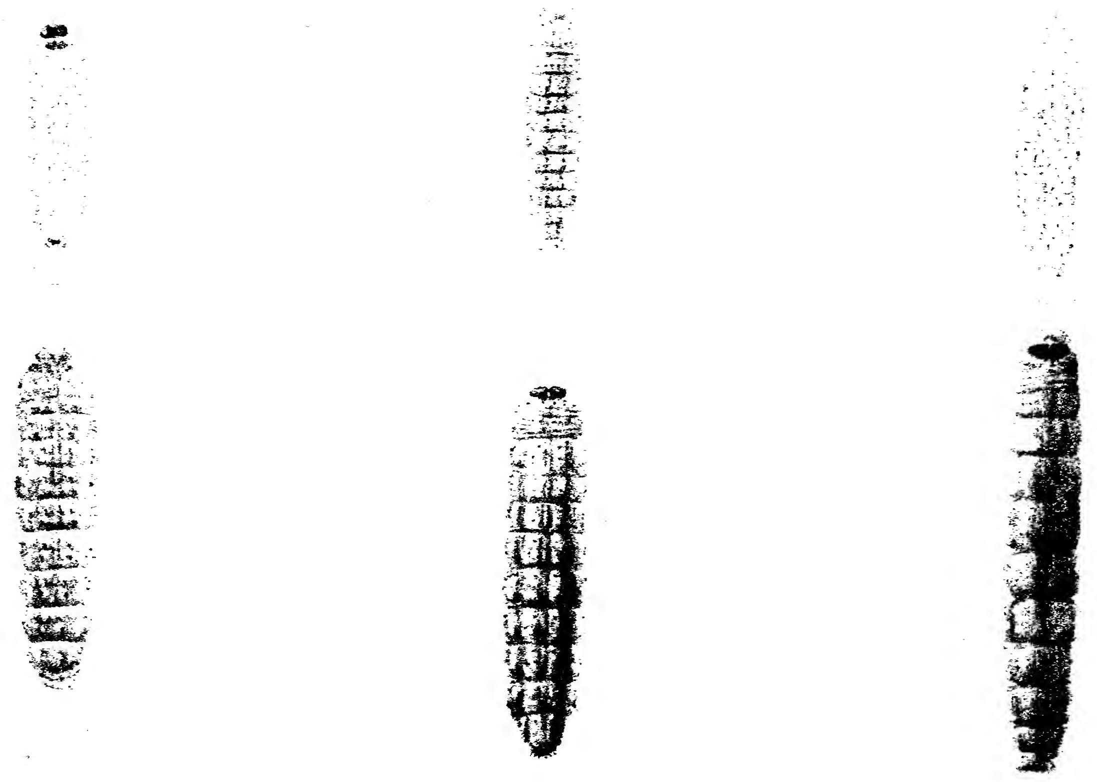


PLATE II.—THE BROWN CUTWORM (*Euxoa radians* Guen.)

From Watercolour Drawings by I. W. HELMSING.

Plate III. shows the arrangement of the setæ on all the segments of *Euxoa radians* first instar. On this larva are found all the setæ illustrated by Fracker in his figure of *Felta gladitoria,* and in addition the minute setæ xa, xb, xc, and xd figured by Ripley in his figure of the mature larva of *Cirphis unipuncta.*

In the case of *Felta gladitoria,* Fracker states: "On the prothorax, eta of the kappa group, all the tau group and sigma are wanting."

In the case of *Euxoa radians* first instar, all of these setæ are present, but are extremely minute.

Eta of the kappa group is shown in close association with kappa. Both tau and omega are present in the tau group. Sigma is present though minute, and is situated on the caudal edge of the coxa of each thoracic leg.

The minute setæ marked xa, xb, xc, and xd are present on the thorax as follows:—

xa is on the caudal margin of the prothoracic shield and xb near the cephalic margin of the mesothorax slightly dorsad of alpha. Both xa and xb are present close together on the metathorax in line with, and cephalad of alpha.

xc and xd are present as one group on the mesothorax, and on the metathorax in line with, and cephalad of epsilon, but further from the cephalic margin than xa and xb.

The prothoracic shield, strongly chitinised and dark brown, has three sensoria (s) ; two just caudad and dorsad of alpha and the third near gamma.

On the abdominal segments 1 to 8 inclusive are to be noted the three minute setæ x, epsilon, and omega, none of which appear in the illustration of *Felta gladitoria.*

On segment 9, epsilon is not present although x and omega are retained.

The homotypy of segment 10 is not clear, so is not fully annotated in the figure, the only named setæ being alpha, beta, kappa, and rho, on the sur-anal plate.

Second Instar Larva (Plate II., fig. 2).

Head capsule width	**·52 mm.**
Epicranial index $\frac{F}{ES}$	$\frac{\cdot 225}{\cdot 09} = 2{\cdot}5$
Length of body	**4 to 6 mm.**
Crotchet formula of larvapods	$\frac{0}{0}\ \frac{4}{4}\ \frac{6}{6}\ \frac{6}{6}\ \frac{8}{8}$

Head capsule colour, light brown when newly moulted, darker later. Prothoracic shield light brown and not conspicuous. The setæ are relatively smaller than in first instar, and some additional "secondary" setæ are present.

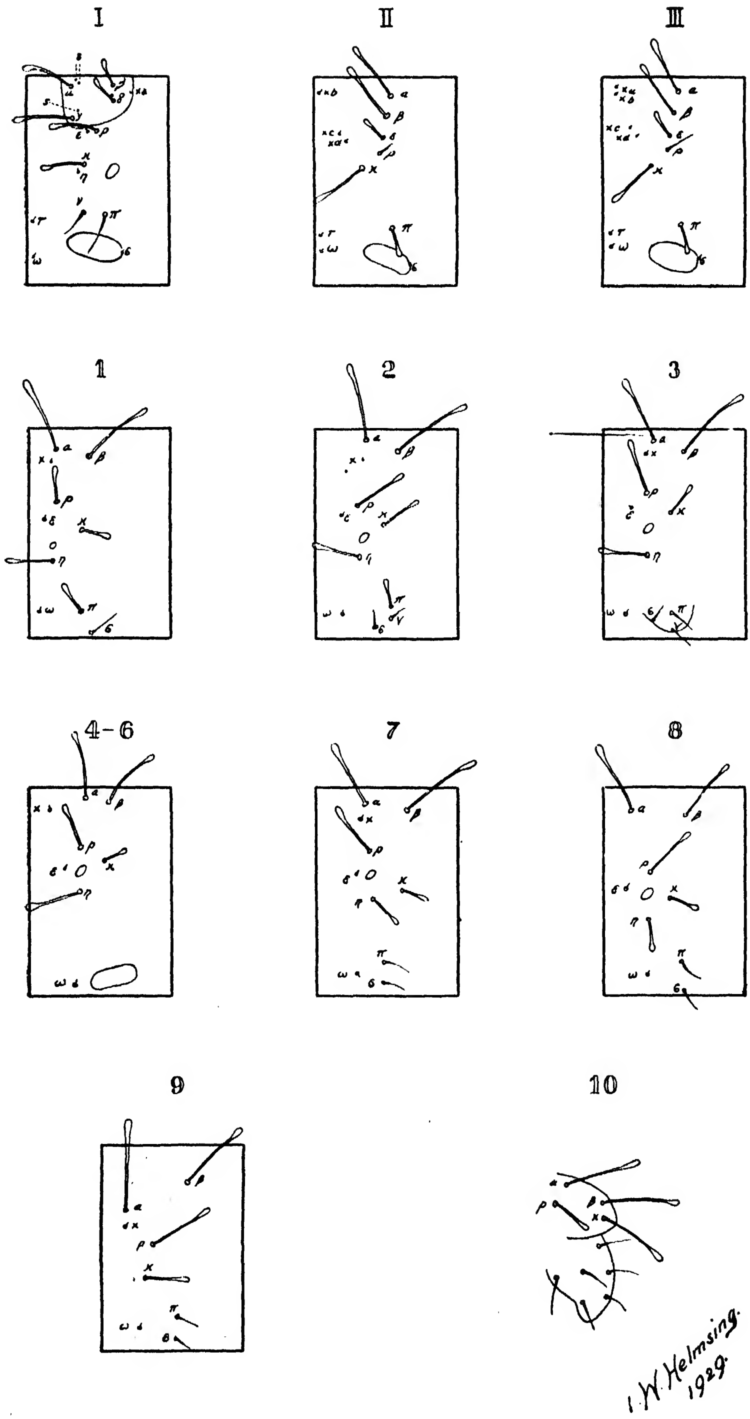


Plate III.

The chætotaxy is the same as in the sixth instar (Plate IV.), and differs from the first instar in the following particulars:—

First thoracic segment.—Substantially the same as in first instar, except some changes in relative position of setæ and the increase in size of sigma.

Second and third thoracic.—As in first instar, with the addition of theta and eta.

First abdominal.—Setæ the same as the first instar, with the addition of mu and nu in the pi group.

Second abdominal.—As first instar, with addition of tau and mu.

Third abdominal.—As first instar, with addition of mu and a larvapod which is still much reduced.

Fourth, fifth, and sixth abdominal.—As in first instar, with addition of mu.

Ninth abdominal.—As in first instar.

The larval skin has very little pigment, faint brown stripes running along the sides being discernible, but the green which shows in the larva is mainly due to the green food contained in the gut.

Third Instar Larva (Plate II., fig. 3).

Head capsule width	·77 mm.
Epicranial index $\frac{F}{ES}$	$\frac{\cdot 30}{\cdot 12} = 2\cdot5$
Length of body	6 to 10 mm.
Crotchet formula of larvapods	$\frac{0}{0}\ \frac{4}{5}\ \frac{7}{6}\ \frac{8}{8}\ \frac{9}{10}$

Head capsule colour, brown. Skin light brown. When feeding, a dirty green colour is the result of the green material in the gut showing through. The larva illustrated had an empty gut and was ready to moult, so that its colour was lighter than the normal. The illustration clearly shows the disproportionate size of the head capsule relative to body size, of a larva ready to go into the next instar.

The wide separation of the two sides of the head capsule, showing the cervacoria, and the space between the back of the head capsule and the prothoracic shield, are both signs of an approaching moult. In larvæ not ready to moult the head capsule is usually partly withdrawn under cover of the prothoracic shield.

The chætotaxy is the same as in the sixth instar.

Fourth Instar Larva (Plate II., fig. 4).

Head capsule width	1·21 mm.
Epicranial index $\frac{F}{ES}$	$\frac{\cdot 420}{\cdot 150} = 2\cdot8$
Length of body	10 to 19 mm.
Crotchet formula of larvapods	$\frac{5}{7}\ \frac{11}{11}\ \frac{12}{13}\ \frac{14}{12}\ \frac{15}{15}$

Colour as in third instar, with a faint red suffusing the dorsum between the brown areas.

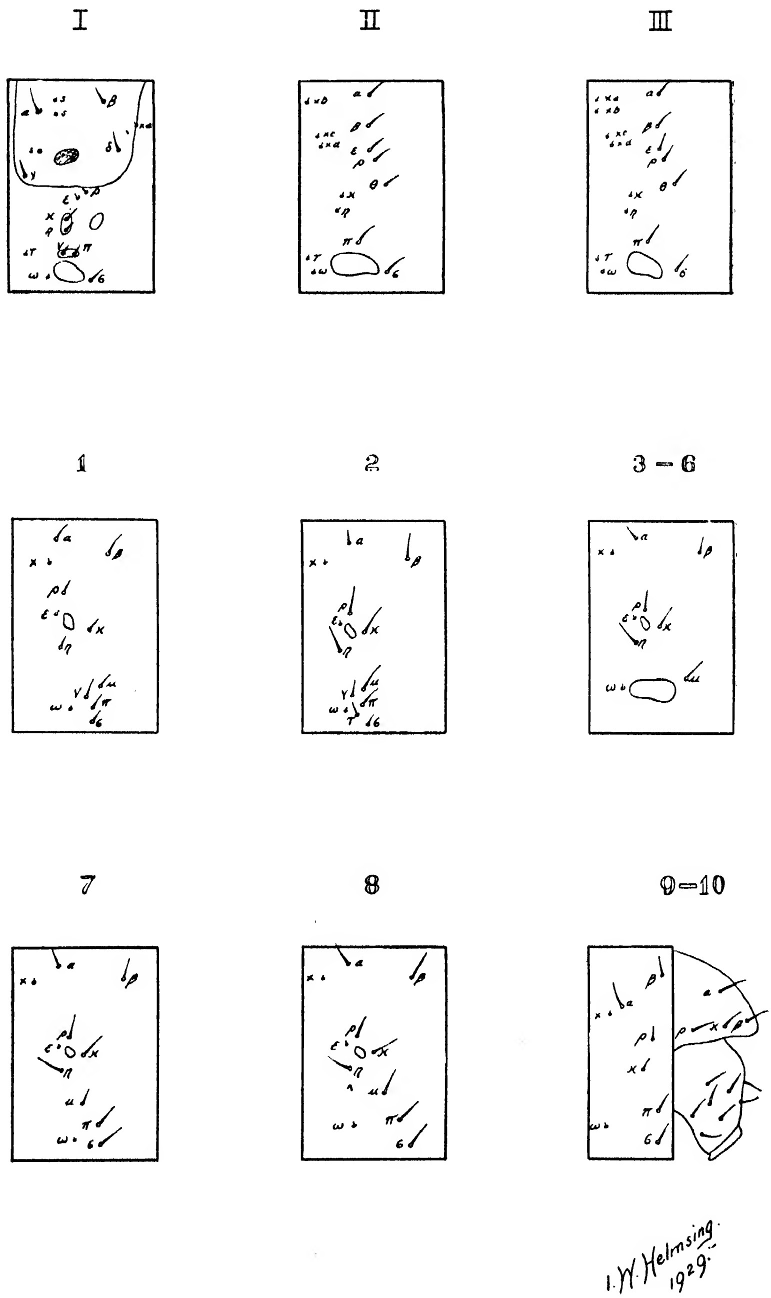


PLATE IV.

FIFTH INSTAR LARVA (Plate II., fig. 5).

Head capsule width	1·89 mm.
Epicranial index $\frac{F}{ES}$	$\frac{.840}{.185} = 2{\cdot}9$
Length of body	16 to 26 mm.
Crotchet formula of larvapods	$\frac{8}{10}\ \frac{10}{12}\ \frac{11}{12}\ \frac{13}{12}\ \frac{13}{15}$

Colour as third instar and chætotaxy as sixth instar.

SIXTH (FINAL) INSTAR LARVA (Plate II., fig. 6).

Head capsule width	2·88 mm.
Epicranial index $\frac{F}{ES}$	$\frac{.85}{.2} = 4{\cdot}25$
Length of body	26 to 44 mm.
Crotchet formula of larvapods	$\frac{12}{15}\ \frac{15}{16}\ \frac{16}{17}\ \frac{17}{16}\ \frac{22}{23}$

The colour is a grey-brown often having a reddish tinge. The general colour in all stages when lifted from the soil is affected by the colour of the food in the food canal and by the soil in which the caterpillar is found.

The setæ are relatively large in the first instar but become relatively smaller with each successive increase in size of the larva, so that the sixth instar larva looks quite naked. The spinneret (Plate VII., figs. 1 and 2) is of the same reduced type all through the larval life history. The chætotaxy is illustrated in Plate IV., and is the same as that described in the second instar.

Dyar's Constant.

The Dyar's constant (i.e., ratio between the width of the head of one instar with that of the next instar) varied to some extent between the different instars, and the figures quoted below are the results of averaging 60 individuals.

Dyar's Constant.—	Between first and second instars ..	— 1·6
	Between second and third instars ..	— 1·5
	Between third and fourth instars ..	— 1·57
	Between fourth and fifth instars ..	— 1·56
	Between fifth and sixth instart ..	— 1·52
	Average for the species ..	— 1·55

Pupa. (Colour Plate I., fig. 2) and (Plate V., fig. 1.)

It is a typical noctuid pupa.

The average length of males and females was taken over one hundred individuals.

Females, average length	19 mm.
Males, average length	17·5 mm.

The range in the length of females during the experiment was from 17·5 mm. to 20 mm. and of males from 14·5 mm. to 19·5 mm. The average width of both sexes was about 6 mm.

Plate V., figs. 2 and 3, shows the difference between male and female pupæ in segments 8, 9, and 10 of the abdomen.

The cremaster on the anal segment has two strong, slightly hooked spines, and a variable number of smaller ones. One function of this organ has already been noted. The colour of the pupa is light amber at pupation, but darkens with age to a rich brown.

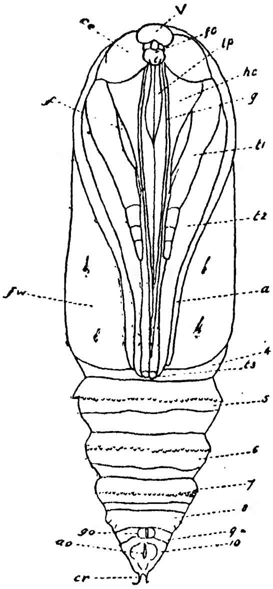
PLATE V.

Euxoa radians Guen.

Fig. 1. Pupa anatomical details.
Fig. 2. Pupa ♂ terminal segments.
Fig. 3. Pupa ♀ terminal segments.
Fig. 4. Mandible of sixth instar larva.
Fig. 5. First instar larva lateral aspect x 15.
Fig. 6. Sixth instar larva lateral aspect x 1½.

Explanation of Fig. 1.

4-10. abdominal segments.
a. antenna.
ao. anal opening.
ce. compound eye.
cr. cremaster.
f. femur of prothoracic leg.
fe. fronto clypeus.
fw. forewing.
g. galea of maxillae.
go. genital opening.
he. cover of haustellum.
l. labrum.
lp. labial palpus.
t1. tibio-tarsus of prothoracic leg.
t2. tibio tarsus of meso thoracic leg.
t3. tibio tarsus of meta thoracic leg.
v. vertex.



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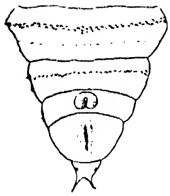

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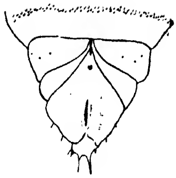

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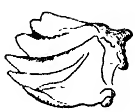

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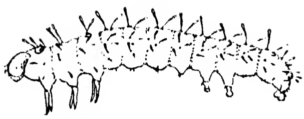

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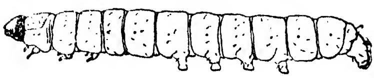

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I.W. Helms 1929

Plate V.

Plate VI.

Head capsules of noctuid larvæ.

Fig. 1. *Euxoa radians* Guen., first instar. Cephalic aspect of head.

Fig. 2. *Euxoa radians* Guen., sixth instar. Cephalic aspect of head.

Fig. 3. *Remigea frugalis* Fabr., last instar. Cephalic aspect of head.

Fig. 4. *Agrotis ypsilon* Rott., last instar. Cephalic aspect of head.

Fig. 5. *Spodoptera mauritia* Boisd., last instar. Cephalic aspect of head.

a. antenna.
a. 1-2. adfrontal setæ.
adf. adfrontal sclerite.
ads. adfrontal sensorium.
adt. adfrontal suture.
an. antocoria.
ar. antennaria.
c. 1-2. clypeal setæ.
cc. cervacoria.
cls. clypeo-labral suture.
cs. clypeal suture.
ea. epicranial arm.
es. epicranial stem.
f. frons.
fl. frontal setæ.
fcs. fronto-clypeal suture.
fs. frontal sensorium.
l. labrum.
l. 1-6. labral setæ.
md. mandible.
o. 1-3. occipital setæ.
oc. 1-6. ocellaræ.
pe. preclypeus.
po. post clypeus.
so. occipital sensoria.
sv. 1-4. vertical sensoria.
v. vertex.
v. 1-9. vertical setæ.

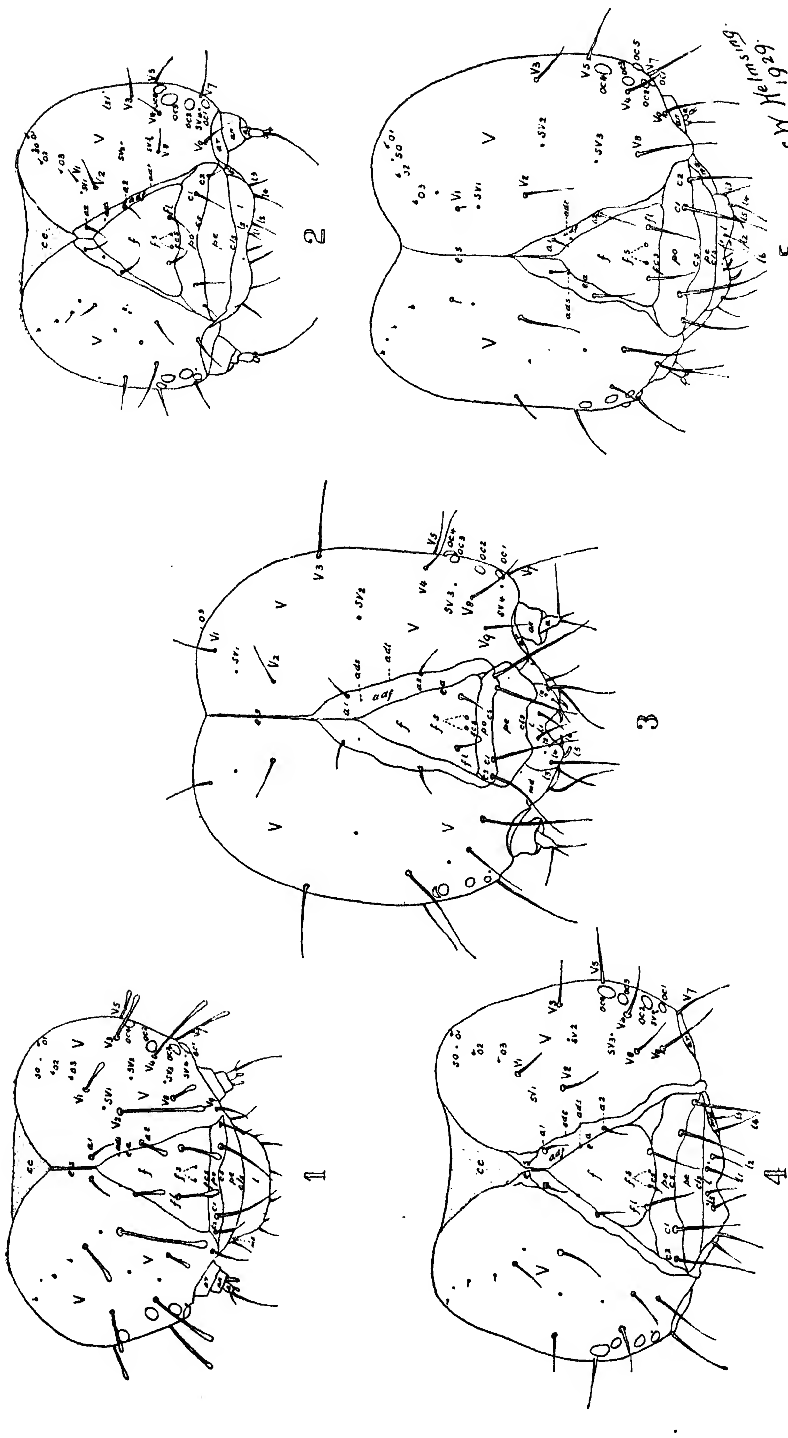


PLATE VI.

PLATE VII.

Fig. 1. *Euxoa radians* Guen. Sixth instar, distal portion of labium, caudal aspect x 60.

Fig. 2. *Euxoa radians* Guen. Sixth instar, distal portion of labium, cephalic aspect x 60.

Fig. 3. *Euxoa radians* Guen. First instar, distal portion of labium, latero-caudal aspect x 264.

Fig. 4. *Remigia frugalis* Fabr. Last instar, distal portion of labium, ventral aspect x 60.

hxs. hypopharyngeal setæ.
lp. labial palpus.
siw. lower lip of spinneret.
pp. palpiger.
sis. proximal sclerite of spinneret.
sio. proximal fold of spinneret.
sir. rudimentary fringe of spinneret.
spr. sensoria of palpiger.
sr. sensorium.
si. spinneret.
sp. stipulæ.
sps. stipular setæ.
smt. submental setæ.
sm. submentum.
siv. upper lip of spinneret.

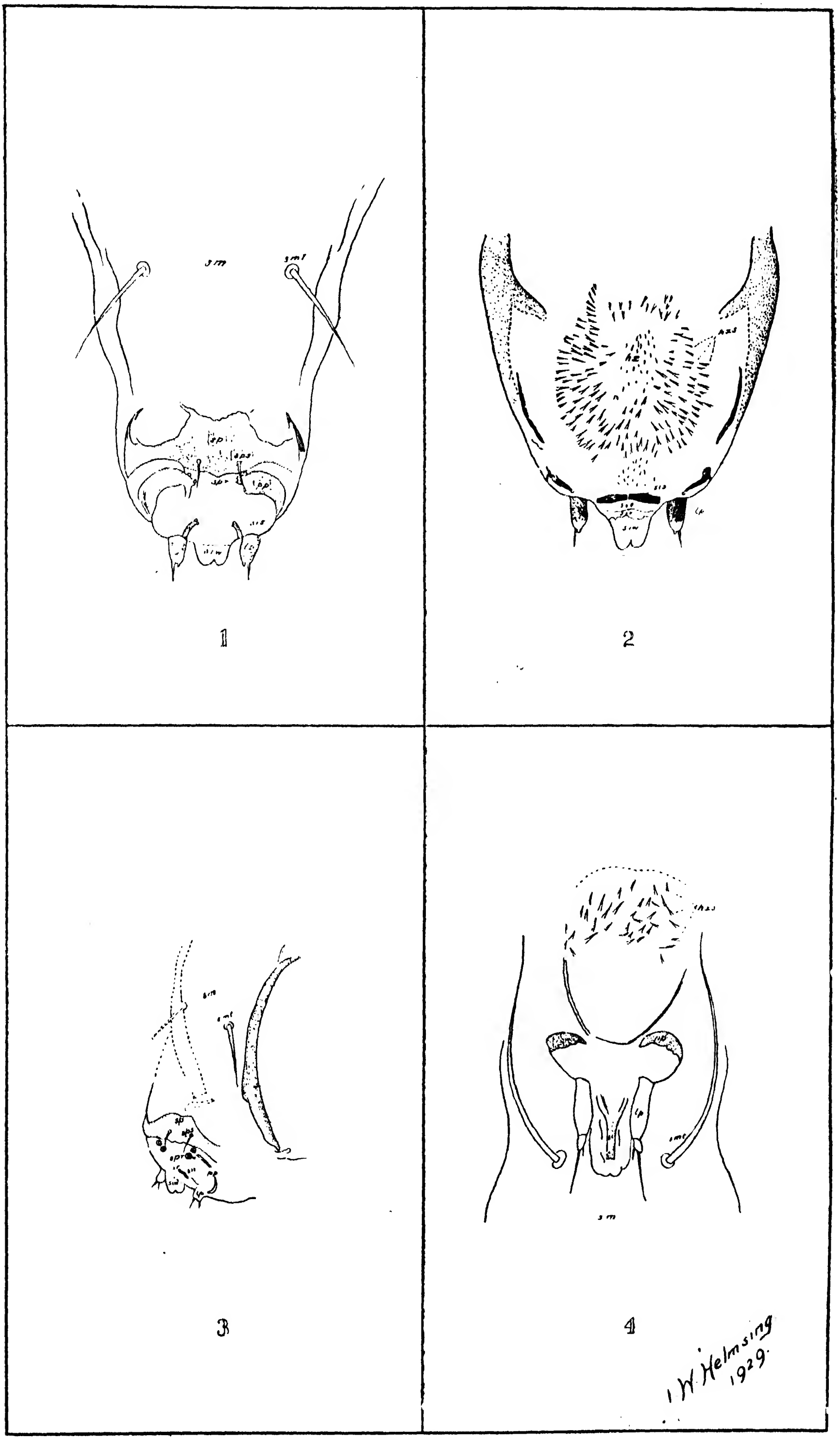


PLATE VII.

COTTON GROWING IN QUEENSLAND.

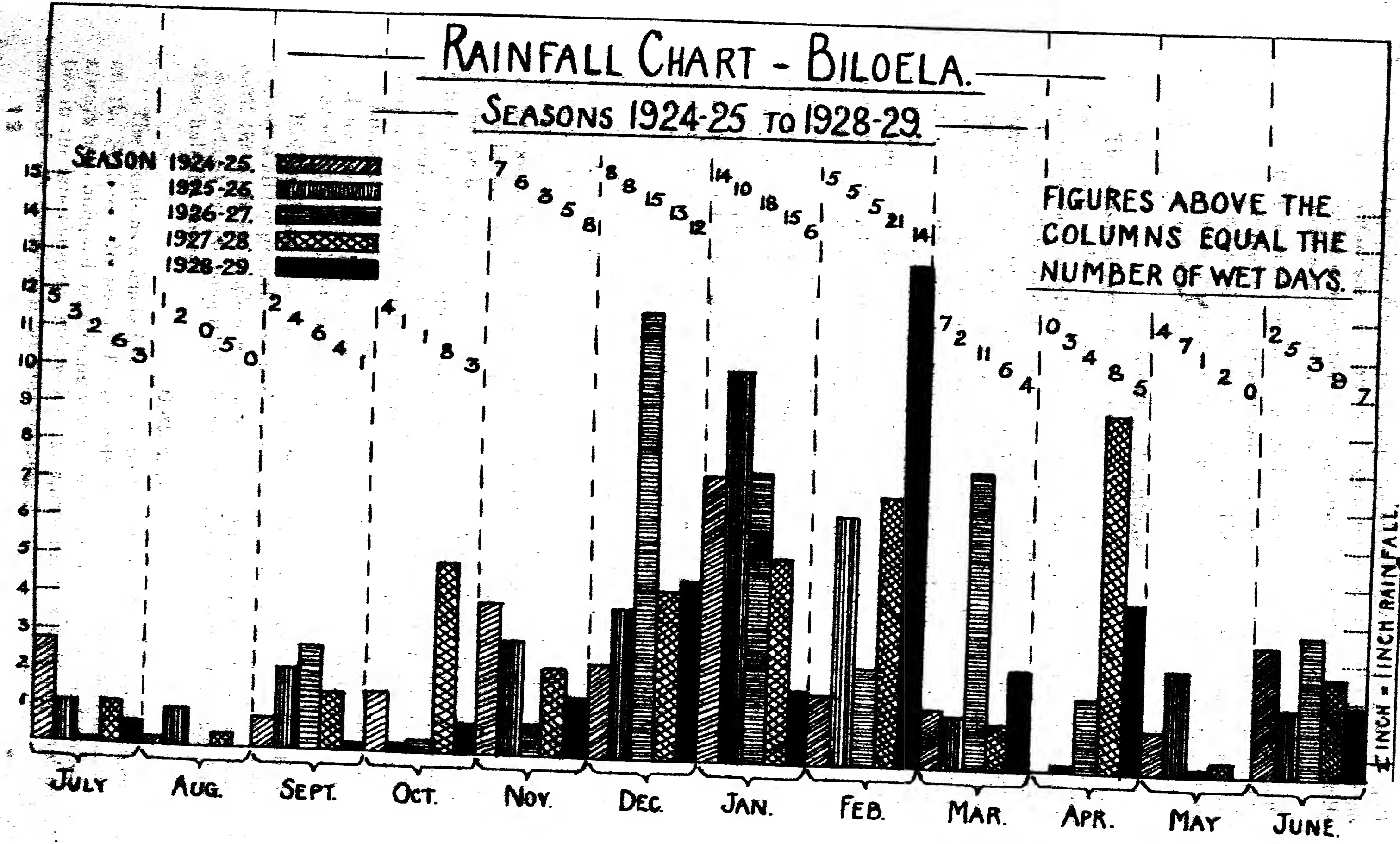
WORK AT THE CALLIDE EXPERIMENT STATION.

Subjoined are extracts from the last annual report of the Cotton Specialist, Mr. W. G. Wells, on the work of the Callide Cotton Experiment Station at Biloela. Mr. Wells discusses many matters of interest not only to cotton growers, but to farmers generally. His general review deals with experiments from which sufficient evidence has been obtained to permit of the drawing of some conclusions. Breeding operations are also described, and the incidence of insect pests reported.—Editor.

Summary.

THE results of the operations of this season are briefly summarised as follows:—

1. Early planting undoubtedly increases the possibilities of obtaining good yields on the average of the soils of the Research Station.
2. The results obtained by most of the growers in the surrounding district are in keeping with this statement.
3. By soaking the seed for three hours immediately before planting them, a clear twenty-four hours' gain in the period of germination may be effected.
4. Planting late-sown cotton in pairs of rows, 6 feet between the pairs, and 4½ feet between the rows of each pair, does not appear to be of advantage on the Station soils. Plant growth indicated, however, that on soils where very rank growth may be produced, this system should be investigated.
5. Planting cotton in widely spaced hills (3½ feet apart) as compared to planting in drills and then thinning to 2 feet apart, the rows being 4½ feet apart in each method, does not appear to be desirable either from the standpoint of yield or efficiency of cultivation.
6. Thinning late-sown plants when they are 6 to 8 inches high appears to be more advantageous than when they are either 10 to 12 or 14 to 16 inches high.
7. Late-sown plants spaced 1 foot apart in rows 4 feet apart appear to produce a greater number of flowers per acre than where the plants are spaced either 2 or 3 feet apart. This is also the case where the rows are spaced 4½ and 5 feet apart.
8. Such a plant-spacing is more susceptible to climatic variations, however, so the greater flower production may not indicate greater yield obtained. Plant growth indicated that possibly, under less adverse seasonal conditions, wider spacing of late-sown plants may be more beneficial.


RAINFALL CHART - BILOELA.
SEASONS 1924-25 TO 1928-29.
SEASON 1924-25.
1925-26.
1926-27.
1927-28.
1928-29.
FIGURES ABOVE THE COLUMNS EQUAL THE NUMBER OF WET DAYS.
1 INCH = 1 INCH RAINFALL.
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE.

9. Applying fertilisers as top dressings when the plants are well established and the early summer rains have started may be of more advantage than putting the fertilisers into the drills before or at planting time.

10. The corn-ear worm is undoubtedly one of the most serious problems the Queensland farmer with late planted rankly grown cotton has to solve. The early planting of cotton, however, appears to offer a decided measure of protection from this pest.

Seasonal Conditions.

The seasonal conditions under review have undoubtedly been the most unfavourable for cotton-growing of any experienced since the Station has been established. Following a total of 2·57 inches of rainfall in June, well-prepared seed-beds were obtained in all of the plots. Unfortunately, only three light showers yielding a total of ·43 inches occurred during July, and no rain fell at all in August. Such conditions dried out the upper surface of the seed-beds to such an extent that good rains were necessary to enable a satisfactory strike being obtained. It was impossible, therefore, to plant on the showers in September and October, although, in areas within a few miles where the precipitations were of a heavier nature, good germinations occurred in sandy or loamy soils. Sufficient rain to enable a strike to be obtained did not occur until 5th November, when ·90 of an inch fell. Unfortunately, no further rain fell until the 19th, so that any irregularities in the depth of planting badly affected the rate of germination, as such a light precipitation evaporated very quickly under the conditions of high maximum temperatures which existed during that period. Good rainfall was experienced early in December, which enabled excellent strikes to be obtained. Showery conditions prevailed from then on to the 25th of the month, after which a dry period accompanied by very high maximum temperatures existed until the 12th January. Scattered light showers occurred from this date until the 7th February, but high temperatures were maintained throughout most of the period. A spell of continuous showery conditions was then experienced until the 23rd of the month, when a long period of hot dry weather again set in, which was unbroken, with the exception of a storm yielding 91 points of rain on the 18th, until the 28th of the month. A good fall occurred then, followed by further rains during the first four days of April. This wet spell terminated the unusually long period of abnormally high maximum temperatures which existed with only slight interruptions from the first of January. With the cooler weather, dry conditions again prevailed and an excellent harvesting period ensued until the middle of June, after which a few light showers occurred.

Killing frosts occurred on the 28th, 29th, and 30th April which destroyed all top growth. Rather low temperatures were then experienced until the 24th May, when a period of four nights of severe frosts was experienced which completely froze all unopened bolls of a size less than half developed.

Cotton.

The yields as a whole have been the lowest that have been obtained on the Station. In many of the plots where very heavy yields have always been obtained, no picking was made this season. The explanation lies in the late planting, followed by an unusually wet February and a series of very severe corn-ear worm attacks.

The rain of the 5th November was just sufficient to obtain a strike under conditions of absolute proper depth of planting and covering of the seed. As some time elapsed before further rain fell, a very irregular rate of germination occured in most plots, and under the existing high temperatures many of the later appearing seedlings died off. This feature was reported generally by the farmers throughout the district who planted on the same rain. Following on the rains of the 4th and 5th December the ungerminated seed in the November planting sprouted. This resulted in a very uneven growth of plant, many of the plots by the end of January having plants 3 feet high adjacent in the same row to the later germinated plants which were only 12 to 18 inches high. This may explain the low yields and rather high degree of corn-ear worm attack which was experienced in the November plantings on the Research Station. In the farmers' crops in the portions of the district where a heavier fall of rain occurred on the 5th November, much better yields were obtained and decidedly lighter corn-ear worm attacks were experienced. Likewise, in previous seasons early November plantings on the Station have given good yields.

The plants made fairly satisfactory growth up to the end of January over the whole of the Station, the early December plantings looking particularly promising. However, under the influence of the two long-pronounced wet periods which occurred in February, nearly all plantings showed a decided tendency to produce an excessive vegetative growth. The situation was further complicated by the high temperatures and dry period which existed during the first half of March. The succulent vegetative growth reacted to such severe conditions, and considerable square shedding occurred. The plants gradually toughened up nicely, however, and might have eventually developed a good crop but for the wet period which occurred from the 27th March to the 4th April, during which around 6 inches fell. This caused a general "bolting" of the plant growth, with the result that much of the Station's crop averaged 5 to 6 feet in height. Corn-ear worm attacks during the latter part of March and early in April further aggravated the tendency to excessive growth. The result of such a combination of adverse conditions, together with early killing frosts, was that the total crop over the whole of the Station was picked by the 8th June, fully a month earlier than usual.

An interesting example of the effect that the condition of the soil may have on the cotton plant was noticed on several low-lying portions of the Station, where the heavy rains caused an accumulation of water for periods of a day or two at a time. In such locations the plants were of a light yellowish green as compared to the dark rich green of the plants over the rest of the Station. They were also shorter and bore very good to even heavy crops of cotton of good quality.

This checking of the growth of late-planted cotton by partial water-logging of the soils has been noticed before on the heavier clay soils in both this valley and in the Wowan and Dululu districts. A sort of physiological drought effect on the plant is produced, which controls the growth to a marked extent and thus allows profitable crops to be produced when the contrary would be expected. Similar results were also obtained this season on the irrigation project at Theodore. There, where the late November crops on clay soils received a heavy soaking irrigation in mid-January, the plant growth was of only moderate development, and much heavier crops were produced than on crops of similar date of planting in the Callide Valley. This was particularly so if the cultivation following the irrigation was unduly delayed. The same

result was not obtained, however, on the rich alluvial loamy soils at Theodore. One late-planted crop on such soil was inspected which had only a few scattered diseased lower bolls. A very rank succulent growth had developed there under the wet February conditions, and an attack by the corn-ear worm had practically destroyed all of the squares formed over the rest of the season.

Fodder Trials.

The testing of different fodder crops to determine which are the most suitable for inclusion in rotation with cotton-growing has again received considerable attention.

As has been pointed out in previous annual reports of the Station, the growing of a winter crop of wheat offers a fairly assured supply of hay of good quality and feeding value. This crop also provides a supply of green feed for the dairyman at the time when the natural grasses have lost much of their food value. Accordingly, varietal tests were again conducted along the lines of the experiment of the previous year, only that the Warren variety was substituted for Warden on account of the susceptibility of the latter to losses from smut.

The following table shows the data obtained from twenty one-sixtieths of an acre plots of each variety; the varieties are arranged in pairs with Florence as the standard in each comparison:—

Variety.	Mean Yield of Sun-Dried Hay in lb. per $\frac{1}{60}$ acre.	Mean Difference.	Value Z.	Odds of Difference being Significant.
Florence	44·19 lb.	2·21	·62	About 150 to 1
Warren	46·4 lb.			
Florence	40·84 lb.	·39	·09	Less than 2 to 1
Roma Red	41·23 lb.			
Florence	48·335 lb.	1·46	·39	19·5 to 1
Warchief	46·86 lb.			
Florence	44·31 lb.	22·86	7·03	More than 10,000 to 1
Skinless Barley	21·45 lb.			

The results of the experiment would indicate that again Skinless Barley has been decidedly inferior to the varieties of wheat tested, as a hay producer. They also indicate that under the seasonal conditions there was no significant difference in the yields obtained in the different wheat variety comparisons except in the Florence-Warren test. In this case, while the difference per plot was small, the statistical treatment by the "student method" gave a very clear indication that under the seasonal and soil conditions Warren was the better of the two varieties, the odds being 150 to 1. As odds of 30 to 1 are considered to be indicative that there is a significant difference in the yielding abilities of two varieties, it can be seen that the results of this comparison were fairly conclusive.

The mean yields of all varieties in the test were decidedly lower than those obtained in the experiment of the previous season. This can be explained by the limited quantity of rainfall which fell during the growth of this experiment as compared to the previous one. Planting was effected on the 23rd June following which 93 points of rain fell

in July in three scattered storms, 17 points in September, and 6 points in October, a total of 1·59 inches during the growing period. A thorough soaking of the seed-bed was obtained soon after the ploughing in April, and 1·64 inches fell in scattered storms during June prior to planting, otherwise it is doubtful if such yields would have been obtained. The previous experiment experienced much better conditions, being planted soon after heavy rain fell early in June, and received 4·56 inches during the growing period, much of which fell when the crop was in the stage of growth requiring ample moisture.

Under the conditions in which this season's experiment was grown, the early maturing variety, Warren, gave good results, and, had the test been planted a fortnight earlier and obtained more benefit of an inch fall then, it is possible that this variety would have showed to better advantage.

Maize.

The testing of maize varieties was again conducted during the past season. The results of the test of the previous season indicated that Improved Yellow Dent obviously required too long a season to be a satisfactory maize for the Callide Valley. Accordingly, only Star Leaming, Funk's 90-day, Reid's Yellow Dent, and Golden Beauty were tried out this season.

Planting was effected on the 14th December and a satisfactory growth was made until the dry heat wave of January was experienced. This decidedly checked the growth of the plants until in all varieties only a stunted weakly stalk was obtained. Under the heavy February rainfall, fairly satisfactory grain was obtained, however.

The results of the experiment, which was in the form of a "Latin square," indicated that there was no significant difference between the yields of any of the four varieties. Star Leaming was the highest yielder (42·4 bushels per acre), and Golden Beauty was the lowest (41·25 bushels per acre).

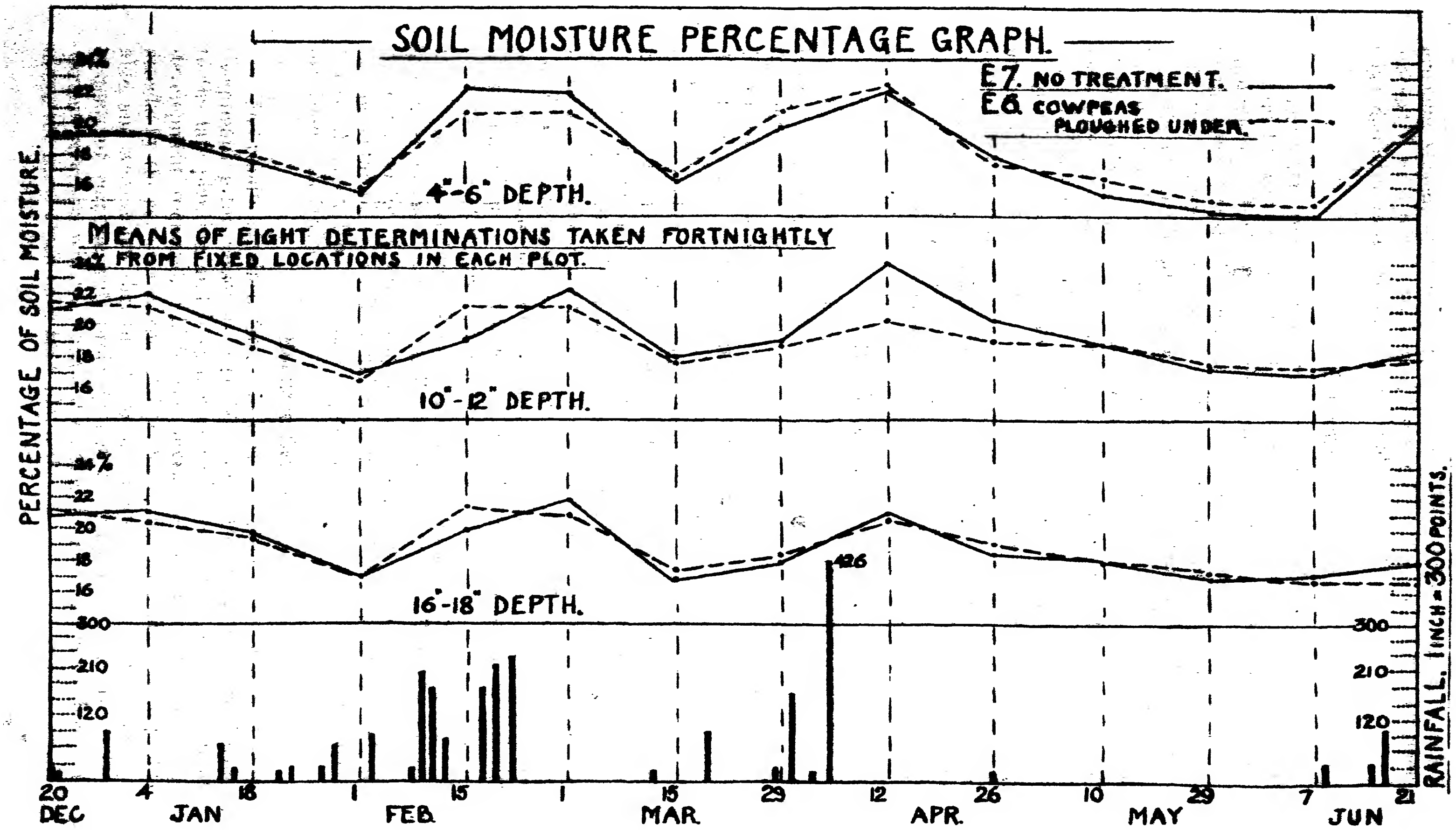
Summer Fodder Crops.

The reliability of the occurrence of the wet season during the months of December, January, and February makes the growing of quick-maturing fodder crops in this period one of the most assured sources of obtaining ample fodder supplies that the cotton-grower in the Callide Valley has. Different crops of this nature are tested out on the Station each season, and the results have always indicated that giant panicum, saccaline sorghum, and Sudan grass can always be relied upon to yield fairly well.

During this past season the plantings of giant panicum made rather slow growths during the dry weather in January, but developed rapidly during the wet weather in February, and yielded on the average around 2 to 2¼ tons of dry hay per acre.

The plantings of saccaline sorghum were mostly on the droughtier soils of the Station and consequently were effected by the dry conditions in January. In spite of this, yields of 12 to 14 tons (green weight) of fodder were made per acre.

Several varieties of Nigerian grain sorghums were also tested for the Instructor in Agriculture of the Central District, but none reached the stage of maturity. It would appear that the combination of a short


SOIL MOISTURE PERCENTAGE GRAPH.
E7. NO TREATMENT.
E6. COWPEAS PLOUGHED UNDER.
4"-6" DEPTH.
MEANS OF EIGHT DETERMINATIONS TAKEN FORTNIGHTLY FROM FIXED LOCATIONS IN EACH PLOT.
10"-12" DEPTH.
16"-18" DEPTH.
PERCENTAGE OF SOIL MOISTURE.
RAINFALL, 1 INCH = 300 POINTS.
426
20 DEC
4 JAN
18
1 FEB
15
1
15 MAR
29
12 APR.
26
10 MAY
29
7 JUN
21

growing season, and the possible "new place effect" which is often associated with newly imported plants, makes these sorghums of somewhat doubtful value for the Callide Valley conditions.

Lucerne.

The 6-acre plot of this crop gave five cuts during the season, and did fairly well considering the periods of long dry spells which it encountered. Unfortunately, this crop appears to be highly attractive to the early broods of the moth of the corn-ear worm. In each of the past two seasons a migration of large numbers of the corn-ear worm from the lucerne to adjacent cotton plots has taken place. Fortunately, both of these have been noticed early in the day of the commencement of the migration. The laying of a poisoned bait of moistened bran and paris green in a furrow between the lucerne and the cotton, and dusting the infested cotton plants on the ends of the rows with calcium arsenate, effectively controlled the migration. The fact that lucerne is such an attractive breeding place for the first of the large broods makes it of somewhat doubtful value to the cotton-grower. Unless he is prepared to watch for the occurrence of such migrations and have materials which will enable him to control them as quickly as they occur, it is likely that much damage may be encountered by growing lucerne in the vicinity of a cotton crop.

Rhodes Grass.

The 11-acre paddock of Rhodes grass has again demonstrated its value. This was sown in January, 1927, in cultivated land of such droughty nature that cotton crops could not be profitably grown on it. Fortunately, good rainfall was experienced in that month and again in March, so that a very good growth was obtained in the first year. The crop was allowed to mature itself in order to have plenty of seed distributed to replant some misses occasioned by washing during the heavy storms in January. From the late months of that winter until now, fourteen heavy draught horses have had access to this plot, and have been kept in splendid condition with a light supplementary ration of maize and lucerne chaff whenever they were working. Even during the late winter months when the upper parts of the plants are badly frosted a green shoot has been present around the base of the stools, and the horses have fed in the paddock, although they had access to a large adjacent area of natural grasses.

It is believed, therefore, that every cotton-grower in the district should experiment with a small plot of this grass. The plot on the Station is on forest soil of clayey droughty nature, and, if such results can be obtained on it, it would appear that this crop offers a cheap source of green food during the period when the native grasses have lost their food value.

Rotation Series.

The results obtained from this series of crop tests have been very disappointing this season as regards yields in the cotton borders. Owing to the late planting and irregular rate of germination, excessive plant development occurred, which was aggravated by loss of crop from attacks by the corn-ear worm. All of the yields of cotton were unprofitable, and were so low that the effects of the cotton crops on the different systems of rotation will probably not be truly representative. The various rotations will be continued during the coming season, however, along the lines which have been planned.

Cotton Experiments.

The majority of the experiments of this season have been badly affected through irregular time of germination, terminal loss, hail damage and, in most cases, corn-ear worm attack. The yields in many have therefore been of little value and have not been considered. In some of such experiments, however, the plants of the first germinations developed fairly normally and it appeared possible to obtain some information on such characters as average boll weight, number of 4- and 5-locked bolls per plant, &c. This was deemed desirable in order to add to the data being collected in the different experiments, many of which are being conducted over a series of years. These have been fully described in previous annual reports of the Station, so only the data obtained this season will be discussed in an experiment.

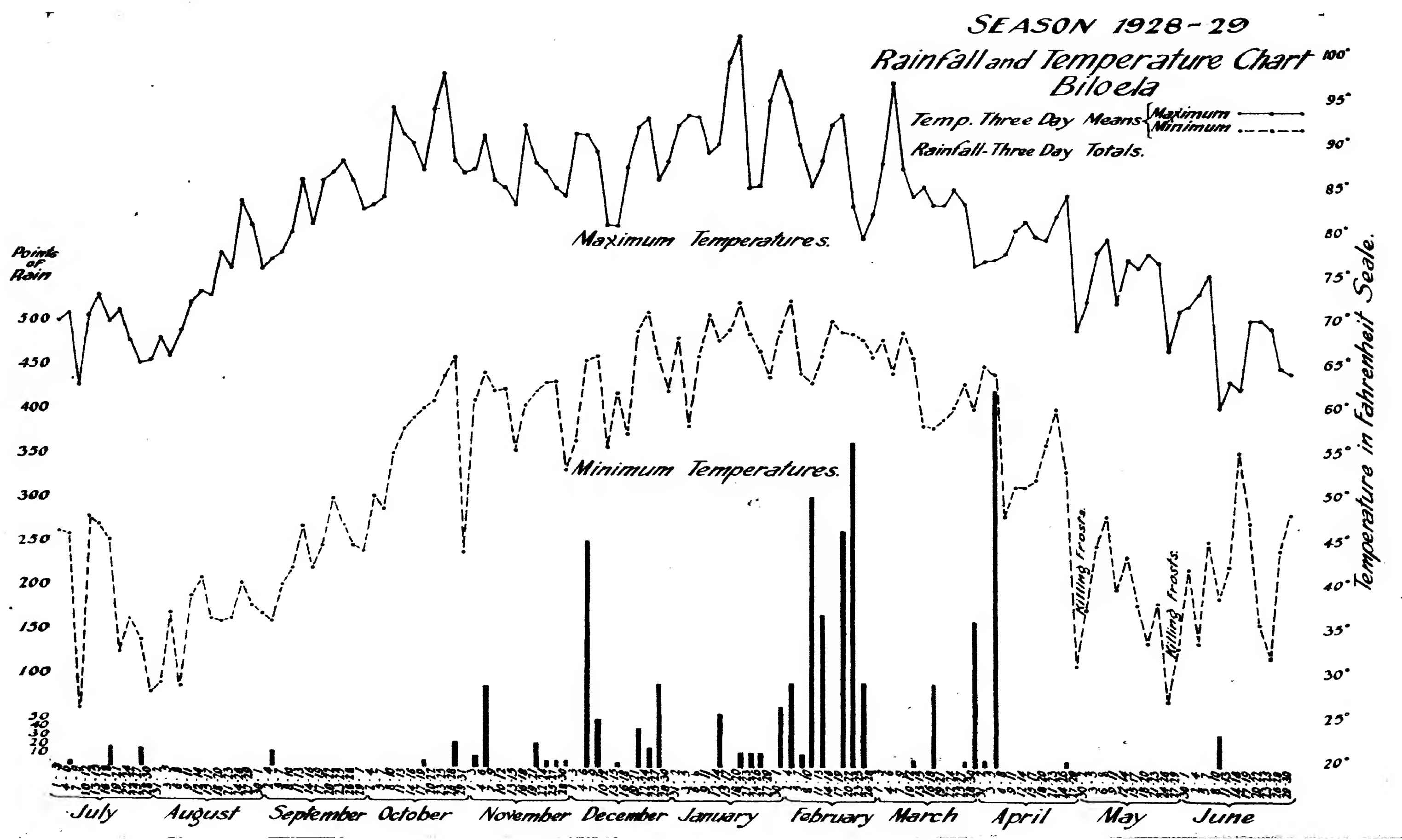
The method used this season to obtain material for examination was to select a number of plants in comparable positions in each border. These locations were spaced at regular intervals on a staggered basis in the three inner rows of each plot of each treatment. The only selection exercised was when the plant at the selected position number had lost its terminal or was adjacent to a blank space, in which case the nearest suitable plant with a terminal was taken.

Time of Planting Experiment.

The adverse climatic conditions prevented the regular programme of monthly plantings, starting in September, from being carried out in the first two months. Accordingly the experiment was re-designed so as to compare early and late November plantings with early and late December ones. Only one November planting was obtained, however, that being made on the 8th of the month. One planting was obtained on the 11th December and another on the 19th of that month.. Unfortunately a delayed complete germination was obtained in the November planting, so the yields are not really true indicators of the possibilities of an early November planted crop on the Station soils.

The early December rains allowed of a good strike being obtained for that month's plantings of the experiment. Rapid growth was made in the two earlier plantings during December, but under the prolonged period of high temperatures during early January the plants toughened up and gave excellent promise of producing profitable crops. The plants of the 11th December sowing were of an especially fine type, and by the end of January were easily the most promising of any ever produced in the December plantings on the Station.

The November planting flowered considerably earlier than did the later ones, flowering being fairly regular by the 6th February in the former whereas it was not until the 18th of the month that flowers in any quantity could be seen in the later sowings. The flower counts for February indicate that the early December planting produced only 25 per cent. as many as did the November planting, and the late December produced only 8 per cent. During March the figures improved, but even then the early December planting produced only 51 per cent. as many flowers as did the November one, while the late December sowing produced only 38 per cent. of the production of the earliest planting.


SEASON 1928-29
Rainfall and Temperature Chart
Biloela
Temp. Three Day Means { Maximum / Minimum
Rainfall-Three Day Totals.
Maximum Temperatures.
Minimum Temperatures.
Killing Frosts.
Killing Frosts.
Points of Rain
500
450
400
350
300
250
200
150
100
50
40
30
20
10
Temperature in Fahrenheit Scale.
100°
95°
90°
85°
80°
75°
70°
65°
60°
55°
50°
45°
40°
35°
30°
25°
20°
July
August
September
October
November
December
January
February
March
April
May
June

Generally speaking, by the 20th of February the November plants were carrying a nice crop of bolls and squares. Following the rainy season, however, excessive vegetative growth developed, which in conjunction with the severe corn-ear worm attack caused nearly a complete loss of squares and even the destruction of most of the lower bolls. Bolls started opening by the beginning of March, but it was not until the 21st of the month that opening was general. The plot was not picked until the 18th May in order to obtain all of the crop in the one picking. The yield was at the rate of 167 lb. per acre.

The 11th December planting entered February in excellent condition, and had only moderate rainfall been experienced in that month it is possible that this planting would have yielded heavily. The excessive rainfall of February, however, forced a very luxuriant growth in this planting, with the result that square shedding was severe. A very heavy corn-ear worm attack was also experienced during February, March, and April, so that practically no bolls set over the upper portions of the plants. The crop of bolls developed was so light that no picking was made until the 7th June, when a yield at the rate of 81 lb. per acre was obtained.

The late December planting was practically an entire failure with only a few scattered open bolls which were not harvested.

The results are in keeping with those obtained in the Time of Planting Experiment of previous seasons. While the November planting was made early enough to have given much heavier yields, the delayed germination really gave plant growth more similar to late November plantings of previous seasons. Comparable returns were also obtained by farmers on similar soils adjacent to the Station. In contrast to these, however, excellent yields were obtained within a few miles of the Station. These sections received storms during the latter half of October which allowed planting to be accomplished, and the early November rains thoroughly established the seedlings. The results over a series of seasons, therefore, indicate that September and October plantings offer the best chances of obtaining profitable yields in the Callide Valley.

The growers should make every effort, therefore, to establish early well-prepared seed-beds in order to be able to obtain a strike on the first planting rains of the season. The figure in this report illustrating the monthly rainfall at the Research Station for the last five seasons clearly indicates that sufficient rain occurs in June to enable a seed-bed to be prepared during that month. It is believed, therefore, if the growers plan their operations so as to enable ploughing to be done in early July, that much of the difficulty of obtaining early strikes will be overcome. Certainly, seasons will occur, such as this past one, where even well-prepared seed-beds will not allow of obtaining a strike owing to scanty rainfall. It is pointed out, however, that this is the first season in the six that the Research Station has been established, in which it has not been able to obtain a strike in late September or early October on early well-prepared seed-beds. An examination of the rainfall figure will show that the precipitations have been very light in September, so it is believed that early planting can usually be accomplished if the proper methods are used. As early planting seems to be correlated with heavy yields and escape from corn-ear worm attacks, it is believed that this is the key-point to successful cotton-growing in the Callide Valley.

Hill versus Drill Planting Experiment.

The merits of planting cotton in hills wide enough apart to allow of cross-cultivation, as compared to the usual method of planting in drills and later thinning out the plants to a distance of 2 feet apart, is of especial interest in a season like the one just completed. In the previous season the experiment on this subject was planted early and gave promise of yielding some interesting information. Unfortunately, through a misunderstanding at harvesting time, the plot was picked in such a manner as to make the yields obtained of little value.

The flower counts of that experiment clearly indicated, however, the yielding possibilities of the two systems. During the first 12 days of the flowering period which commenced on the 19th December, the single plants in the hills which were spaced 3½ feet apart in rows 4½ feet apart produced only 58·3 per cent. as many flowers as did the 2-foot spaced single plants in the same row spacing. During January the wider spaced plants gained somewhat, but still produced only 73·4 per cent. as many flowers as did the other treatment. The wet conditions in February accelerated the growth of the larger plants, however, with the result that they produced about the same number of flowers as did the 2-foot spaced plants. The flowering in the wider spaced plants fell off after this, only 94·8 per cent. as many flowers being produced in March as in the closer spacing.

The experiment of this season was planted 32 days later than was the one of last season. This caused a delay in the start of general flowering until the 21st of January as compared to the 19th December in the previous experiment. The wide-spaced plants did not produce as many flowers as did the closer-spaced ones in any of the three months in which the observations were taken. The numbers of flowers of the wide-spaced plants were of the following percentages of the 2-foot spaced plants:—January 47·3 per cent., February 72·0 per cent., March 70·2 per cent. These compare with the following percentages for the preceding season:—January 73·4 per cent., February 101 per cent., March, 94·8 per cent. It would appear, therefore, that the 3½-foot spacing between the plants was not as conducive to producing flowers per given area of row as was the 2-foot spacing. It would also appear, for the two seasons under review, that, when the crop is planted late and experiences a wet season, the difference in flower production between the two spacings is all the more pronounced than when the crop is planted early.

Owing to the severe maize-grub attacks which were experienced in this section of the Station, the yields were so low that no reliable data could be obtained from them. A portion of the plots where sufficient cotton was present as to afford some idea of the yielding abilities of the spacings was picked, however, although simply as a bulk picking of six short rows of a total area of approximately one-eighth of an acre of each treatment. It is recognised that such data are of little value, but the fact that in these two plots the 2-foot spacing yielded 100 per cent. heavier, being at the rate of 832 lb. per acre as compared to 416 lb., would indicate that probably the closer spacing would have produced at a heavier rate over the whole of the experiment but for the maize-grub attack.

In order to afford material for an examination of the effect of the spacings on the individual plant, 30 plants were selected, in the manner as previously described, in each treatment in the plots which were harvested.

The table records the data obtained from the material collected.

Data referring to Boll Formation and Weight of Bolls (Grammes) in Hill versus Drill Planting Experiment.

	Drill.				Hill.			
	Mean.	P.E.	S.D.	P.E.	Mean.	P.E.	S.D.	P.E.
Number of 5's ..	4·8	± ·35	2·82	± ·25	5·27	± ·35	2·82	± ·25
Number of 4's ..	6·4	± ·47	3·8	± ·35	6·03	± ·40	3·27	± ·28
Green 5's	·53	± ·09	·72	± ·06	1·13	± ·20	1·65	± ·14
Green 4's	7·6	± ·70	5·7	± ·50	6·6	± ·60	4·54	± ·40
Total number of bolls	24·47	± 1·02	8·32	± ·72	23·87	± 1·24	10·06	± ·88
Total S/c. per plant ..	91·28	± 4·34	35·21	± 3·07	85·99	± 3·39	38·88	± 4·79
Number of bolls per lb. S/c.	72·75	± 1·62	13·19	± 1·15	75·33	± 1·07	8·68	± ·76
Average weight 5 ..	6·94	± ·12	·92	± ·08	6·59	± ·11	·92	± ·08
Average weight 4 ..	6·07	± ·12	·92	± ·08	5·36	± ·20	1·59	∓ ·14

Dif. average weight of 5 and 4-locked bolls = ·87 ± ·17 grammes. $\frac{D}{E} = 5{\cdot}1$

Dif. average weight of 5 and 4-locked bolls = 1·23 ± ·23 grammes. $\frac{D}{E} = 5{\cdot}35$

The data would indicate that there was no significant difference between the two spacings in any of the plant characters examined. In each treatment, however, the average weight of a 5-locked boll was significantly greater than that of the 4-locked boll. The difference was greater in the hill spacing, but this may have been caused by the considerably higher variation between the plants in this treatment, the coefficient of variability* being approximately twice that in the drill spacing.

The notes taken during the growth of the experiment indicate that the plants in the hill treatment had a heavier vegetative development and tended more to lodge. This latter feature was present last season in both a similar experiment and one in which different numbers of plants were left in hills spaced 3½ feet apart. This tendency to lodge prevents close working to the plants in the later cultivations, and thereby defeats the purpose for which the wide spacing is intended. Based on the results obtained for the two seasons it would appear questionable if there is any advantage to be gained by such wide spacing of the plants, as far as cultivation is concerned, and it may be possible that lighter yields will be obtained if this practice is followed.

Height of Thinning Experiment.

This experiment was planted following on the rain of the 8th November, but unfortunately suffered a variable germination in common with the rest of the plantings at this date. The yields, therefore, are of little value, although those obtained from two "Latin Squares" of this experiment indicated that the latest thinning produced the lowest yield. The variation in age of the plants makes the yields unreliable, however,

* Coefficient of variability $= \frac{SD \times 100}{M}$

so only the flowering data and the material from 60 selected plants in each treatment will be considered. The plants were selected by the method previously described, so it is believed that the results are truly representative of the three treatments under the conditions in which they were grown.

The thinnings were performed when the plants were 6 to 8, 10 to 12, and 14 to 16 inches tall, to a distance of 24 inches apart, one plant to a space. Observations on the 24th January gave the impression that little difference existed between the two earlier thinnings, but the effect of the delayed thinning during the favourable growing conditions in December had given the 14 to 16 inch thinning a decided "spindly" appearance, with practically no bottom crop. The effect of the prolonged high temperatures and lack of rain was noticeable in all three treatments, the fruiting branches produced during that period showing a decided shortening of length of internodes as compared to the rather long internodes produced during the luxuriant growing conditions.

Owing to the variation in stand and the loss of terminals from a hailstorm, it was believed that the usual flower counts in the centre rows of each plot would be of little value. In an effort to obtain as much information as practicable on this factor, it was decided, therefore, to select 20 plants in each plot of each treatment by the same method as was used in selecting the plants from which to obtain material for boll weight determinations, &c. Accordingly, daily flower counts were made on 120 plants in each treatment, and the following data were obtained:—

FLOWER COUNTS OF HEIGHT OF THINNING EXPERIMENT.

Treatment Height.	30th January to 28th February.	Per Cent of Total.	Rest of Season to 4th April.	Total.	Percentage based on 6 to 8 as 100.
6 to 8 inches	3,147	61·5	1,979	5,126	100
10 to 12 inches	2,641	56·3	2,049	4,690	91·5
14 to 16 inches	2,129	53·5	1,851	3,980	77·8

It would appear, as was the case last season, that the earliest thinning was conducive to an early formation of the fruiting branches and thus allowed of a heavier production of flowers during the first period of flowering. In the previous season this advantage was overcome, however, as the later thinnings produced higher total numbers of flowers for the season. The explanation of such a result appeared to lie in the fact that, under the favourable seasonal conditions during the early growth of the plants, a rather vegetative development occurred in the early thinned plots. Considerable shedding of squares took place on this growth during unfavourable conditions in January and February, which thereby reduced the later flowering. There was a tendency to produce flowers in somewhat similar manner this season, but the flowering season being so much later than in the experiment of last year, the later thinned plants could not overcome the initial advantage of the early thinned ones.

The data obtained from the boll material collected from the 60 selected plants in each treatment can best be summarised in the manner set out in the accompanying table:—

BOLL DATA FOR HEIGHT OF THINNING EXPERIMENT.

Total number of bolls per plant	Most on the earliest thinning; least on latest one. Differences not significant statistically.	
Number of bolls per lb. of seed cotton	Differences irregular. Differences not significant statistically.	
Harvested bolls expressed as per cent. of total crop per plant each treatment	6 to 8, 55·7 per cent. 10 to 12, 54 per cent. 14 to 16, 47·3 per cent.	
Average weight seed cotton per plant	Most on the earliest; least on latest. Difference between— 6 to 8 and 10 to 12 treatment, not significant, $\frac{D}{E} = 1{\cdot}43$ 6 to 8 and 14 to 16 treatment, significant, $\frac{D}{E} = 4{\cdot}10$ 10 to 12 and 14 to 16 treatment, not significant, $\frac{D}{E} = 2{\cdot}47$	
Difference in number of 5- and 4-locked bolls per plant harvested in each treatment	Treatment— 6 to 8—Slight tendency for more 5's, not significant. 10 to 12—Greater tendency for more 4's, $\frac{D}{E} = 2{\cdot}39$ 14 to 16—Significant tendency for more 4's, $\frac{D}{E} = 5{\cdot}0$	
Difference in number of 5- and 4-locked green bolls per plant unharvested	Treatment— 6 to 8—Highly significant in favour of 4-locked $\frac{D}{E} = 9{\cdot}26$ 10 to 12—Highly significant in favour of 4-locked $\frac{D}{E} = 10{\cdot}7$ 14 to 16—Highly significant in favour of 4-locked $\frac{D}{E} = 11{\cdot}0$	27 per cent. 5-locked 22 per cent. 5-locked 25 per cent. 5-locked
Difference in average weight of 5- and 4-locked bolls per plant	Treatment— 6 to 8—Highly significant in favour of 5's $\frac{D}{E} = 9{\cdot}43$ 10 to 12—Very significant in favour of 5's $\frac{D}{E} = 6{\cdot}95$ 14 to 16—Highly significant in favour of 5's $\frac{D}{E} = 9{\cdot}15$	4's, 83 per cent. as heavy 4's, 83 per cent. as heavy 4's, 83 per cent. as heavy
Percentage of the average number of 5-locked bolls of the average total number of bolls per plant	Treatment— 6 to 8—26·9 per cent. 10 to 12—20·9 per cent. 14 to 16—20 per cent.	

It would appear from the above data that, under the conditions in which the experiment was conducted, the earliest thinning gave these advantages:—A few more bolls per plant; a slightly larger percentage

matured by time of first frosts; slightly more seed cotton than in the 10 to 12 treatment, and significantly more than in the 14 to 16 inch thinning; a higher percentage of 5-locked bolls of the total number of bolls borne per plant; and a higher percentage of 5-locked bolls in the bolls harvested.

The results would indicate, therefore, that the heavier rate of flowering observed in the earlier thinnings during the first period of flower counting was apparently to the advantage of these thinnings, in that a better yield was obtained by the time of the first killing frosts. This advantage in yield can be explained by the fact that, not only was there a higher percentage of bolls matured, but also there was a greater percentage of 5-locked bolls in the crop harvested. As the 4-locked bolls weighed only 83 per cent. as much as the 5's, it can be seen that this would materially influence the yield.

The results are different in some respects to those obtained last season in a similar experiment. Then, the total number of harvested bolls per plant ascended in favour of the later thinnings. The number of 5-locked bolls per plant averaged about the same in each treatment, but there was a significant difference against the 6 to 8 height of thinning in the number of 4-locked bolls per plant between the 6 to 8 and 10 to 12 treatments (D over E = 3·85), and between the 6 to 8 and 14 to 16 treatments (D over E = 4·4), and just hardly a significant difference in favour of the 14 to 16 inch thinning as compared to the 10 to 12 treatment (D over E = 3·05). The percentage of 5-locked bolls of the total number of bolls harvested per plant in each treatment was somewhat of the same order as in this season, with the exception that the 10 to 12 treatment had a higher percentage than did the 6 to 8: the figures are 6 to 8 27·9 per cent., 10 to 12 30·4 per cent., and 14 to 16 25·8 per cent. There was not such a range between the treatments as was the case this season.

The results obtained from the experiment for the last two seasons would indicate that thinning when the plants are 6 to 8 inches in height is conducive to the early development of the fruiting branch structure. This allows of the earlier production of flowers, and gives this height of thinning an advantage over the other heights tried. In a late planted crop this is of decided value, as a larger number of bolls will be harvested if early frosts occur. Apparently, in a late planted crop, there is a higher percentage of 5-locked bolls developed in the earlier maturing bolls of the 6 to 8 inch thinning than in either of the other two treatments. As the weight of the 4-locked bolls in the late planted experiment of this season averaged around 83 per cent. of the weight of the 5-locked, and from 84 per cent. to 90 per cent. in early planted plots of the previous season, it would appear that this greater percentage of 5-locked bolls in the earlier formed bolls is of decided advantage, especially in a short season.

Insect Problems.

Insect pests affected the yields obtained on the Station this season more than has been the case in any previous crop. The outstanding one was the corn-ear worm which completely destroyed the top crop of squares on all the late-planted cotton. Other insects present and causing varying amounts of damage were thrips, pink boll-worm, rough boll-worm, and the sucking bugs.

THRIPS (*THRIPS TABACI* LINDEMAN).

This insect was present during the early stages of the plant growth, and caused serious loss of terminals in many of the November planted plots. It was also present in the December planted plots, but to a much lesser degree. As in previous seasons, the presence of this insect after November appears to be correlated with the amount of rainfall. Under good rainfall there is but light infection in December, but when the precipitation is scanty in this month damage may be done even on plants a foot or more high.

CUTWORMS (*EUXOA RADIANS* GUEN.).

Owing to the fact that there was no cotton planted on the Station in either September or October, it cannot be stated if cutworms were present during this past spring. No reports were received of serious damage in the immediate district where October planting was obtained, so it is not believed that this pest was present in sufficient numbers to be of economic importance.

CORN-EAR WORM (*HELIOTHIS OBSOLETA* FABR.).

The Station suffered from attacks by this pest, the worst of any year since it has been established. The explanation appears to lie purely in the fact that all of the plots were late planted. The experiences of previous seasons have all demonstrated that late-planted crops on the Station soils are liable to attacks from the corn-ear worm. The conditions during this past season have been eminently suitable for heavy occurrence of this pest, and the losses received were to be expected.

Each season supplies evidence that damage from corn-ear worms and late-planted crops on rich alluvial loamy soils are very closely correlated. Exceptions occur, of course, but generally speaking this is true. Late-planted crops on clay soils, however, appear to be fairly free from atttack to an amazing extent. The explanation appears to lie in the nature of the plant growth. On rich alluvial loams the late-sown plants make a rapid sappy vegetative growth if the climatic conditions are at all favourable. On clayey soils, crops planted at the same time and receiving similar rainfall usually make a much slower and tougher growth which apparently is not attractive to this insect.

The lucerne plot on the Station was again the source of an invasion from the corn-ear worm. On the 31st January a migration of grubs similar to that of last season crossed the 18-foot roadway into E. block. This followed a rapid drying off and wilting of the lucerne. Bran, paris green, and molasses bait was scattered down the road, and in the cotton rows at right-angles to the road the plants for a distance of a chain were hand-picked of all larvæ. The measures taken were entirely successful. The emergence of moths responsible for this brood commenced following the 2·55 points of rain on the 4th and 5th December.

PINK BOLL WORM (*PLATYEDRA GOSSYPIELLA* SAUNDERS).

The light yields caused by the late planting and heavy corn-ear worm attacks prevented an examination of any value from being made in the plot which is annually examined for pink boll-worm. It was thought advisable, however, to attempt to obtain some data regarding the presence of this insect this season. Accordingly, 200 bolls were examined in a plot in the same portion of the field and only one worm was found. This was not a comparable test to the one of the previous

season, so no significance can be attached to the result. An isolated progeny increase planting in the orchard plot on top of the hill was also examined. This plot was adjacent to soft vine scrub and lay in line between the location of the first cotton plot ever planted in the district, and the bulk of the Station plots. As it is thought that the site of the first crop might be the original source of infection for the district, it was considered the progeny plot might show results of interest.

The material used for this examination was off-type plants which had been pulled up in the breeding operations. Ninety plants were taken, which came from all parts of the plot, which was about one-third of an acre in area. A total of 1,798 ripe and 2,658 green bolls were examined on those plants and the following numbers of pests obtained:—Pink boll-worm, 90; rough boll-worm (*Earias huegeli*), 28; and Peach sometimes called Maize Grub (*Conogethes punctiferalis* Gn.), 21. The number of pink boll-worms does not mean that percentage of boll infestation, however, as several bolls contained 2 worms and three bolls 3 worms. Unfortunately, the records were not taken so as to give the actual percentage of attacked bolls. Of the ninety plants examined, twenty-five did not have a pink boll-worm.

The results obtained in this inspection made it appear desirable to examine a crop in some other portion of the district. Accordingly, a field in the centre of an alluvial flat and some 12 miles from the Station was examined. Unfortunately, it was late in the season and only the green bolls of the upper part of the plants were available. The material is therefore hardly comparable with that obtained in the Station plot. The procedure adopted here was to select scattered well-laden plants over the field, which covered approximately 10 acres. As in the orchard plot on the Station, every boll was taken off each selected plant and thoroughly examined. A total of 2,300 bolls were inspected in this manner and the following worms found:—Pink boll-worm, 45; rough boll-worm, 18; peach grub, none. Seventy-two plants were examined, and thirty-six did not have a pink boll-worm in the green bolls.

During the above-described examinations a factor was observed which may have a decided bearing on the control of the pink boll-worm. It was noticed that in a considerable number of the attacked bolls the shrivelled form of the pink boll-worm still remained. Often a small whitish cocoon was found adjacent to it. This led to a close examination of the live larvæ which were found, and one was obtained which had three eggs laid on the back around the head. These eggs were hatched out but unfortunately the larvæ went into cocoons before they were noticed. The cocoons appeared to be identical with those found in the attacked bolls. Through an accident the three cocoons were destroyed, so some of the cocoons found adjacent to the parasitised pink boll-worms were forwarded to the Chief Entomologist at Brisbane. He has kindly advised that what appears to be a species of *Apanteles* emerged from these cocoons.

It would appear, therefore, that the population of pink boll-worms is not a serious economic factor in the Callide Valley at present. The presence of so many in a small plot near the softwood scrub indicates, however, that very careful methods of cleaning up the cotton crop should be exercised at the end of each season. This clean-up should be performed as early as possible, as many of the larvæ were found in the old diseased bolls, and an early destruction of the plants would have killed most of them.

SUCKING BUGS.

The False Stainer (*Aulacosternum nigrorubrum* Dall.) was present in larger numbers throughout most of the season than has ever been the case in previous crops on the Station. In fact, it appeared to be in as large numbers during the latter part of the season as was *Dysdercus sidæ*. It may be possible, therefore, that it is responsible for some of the punctures which in the past have been laid to *Dysdercus* and *Tectacoris lineola*. The fact that it occurs in large numbers during the squaring season, when there are practically no bolls on the plants, may also indicate that it is responsible for some of the square shedding, or, possibly, the peculiar late loss of terminals which has been experienced in the last three seasons.

The Harlequin Bug (*Tectacoris lineola* F.) was not seen until the 3rd February. Shortly afterwards, small numbers of both sexes were seen and a few clusters of egg colonies were found. This insect was hardly noticeable during the rest of the season, and was in even fewer numbers than in the previous season.

The large and small Stainers (*Dysdercus sidæ* Montr. and *Oxycarænus luctuosus* Montr.) were present, but in light numbers.

FRUIT FLY IN JAVA—A CORRECTION

In an article entitled "The Banana Weevil Borer in Java, with Notes on other Crop Pests," published in the Agricultural Journal of December, 1928, it was stated that the Mediterranean Fruit Fly (*Ceratitis capitata*) attacked citrus in Java. Advice has now been received from Java that the Mediterranean Fruit Fly does not occur in that country, the species being responsible for attacks on citrus being *Dacus ferrugineus*, which is controlled by poison bait sprays. Apparently this regrettable error arose through a misunderstanding in discussing fruit fly infestation in Java.

QUEENSLAND SHOW DATES.

AUGUST.

Peak Hill (N.S.W.), 5-6.
National Association, 11-16.
Crow's Nest, 27-28.
Wynnum, 29-30.

SEPTEMBER.

Parkes (N.S.W.), 2-3.
Imbil, 3-4.
Malanda, 5-6.
Bogan Gate (N.S.W.), 10.
Gympie, 10-11.
Redcliffe, 12-13.
Beenleigh, 19-20.
Rocklea, 27.
Esk Campdraft, 26-27.
Kenilworth, 27.

OCTOBER.

Southport, 3-4.
Enoggera, 4.
Nerang, 10.

NEW ZEALAND FARMERS IN QUEENSLAND.

The idea of mutual visits of farmers to New Zealand and Australia has developed greatly in recent years, and the tour lately of a party of New Zealand producers through the south-eastern corner of this State suggested even greater expansion of that idea in the future.

The need of the farmers of the Commonwealth and Dominion is to meet one another more, and to get to know something of each other's problems and successes, as well as to realise that they are not so much competitors as fellow-workers.

Personal contact and social interchanges mean, too, the removal of many misunderstandings and misconceptions and altogether a better appreciation of the fact that if we work together we can increase the prosperity of each Dominion, and at the same time add to the wealth and security of the British Empire as a whole.—EDITOR.

WARWICK was the first halt in the recent tour of a comparatively small section of Southern Queensland by a party of New Zealand farmers, who had come to see for themselves something of the Commonwealth and its country life. With all its orchards bare of leaf under a grey winter sky, the fruitful Granite Belt was not looking its best when the visitors passed through. Sufficient was seen, however, to suggest a sure, though strenuously acquired, prosperity in Queensland's apple uplands. When they reached the gateway of the Darling Downs, that vast territory said by Sir John Russell, of Rothamsted, to be one of the most fertile tracts of black-soil lands in the world, they saw something of the country on which Queensland's title as the most richly endowed State of the Commonwealth is based.

A Queensland welcome awaited the visitors at Warwick. Recent rains had caused a curtailment of the tourists' programme, and road travel was limited to the environs of the wheat land centre. From points of vantage, miles and miles of farming lands divided into wide valleys by lightly wooded uplands and rimmed by mist-wrapped mountain ranges were spread before the visitors' view. It was a winter landscape, nowhere to be matched within the Commonwealth—a countryside green with growing crops giving promise of a bountiful harvest, and dotted with homesteads on the banks of willow-shaded streams.

Mr. Colin McIntosh, leader of the Delegation, speaking on behalf of his fellow farmers, said that Warwick and its beautiful surroundings had greatly impressed them. Their party consisted of active farmers, and the object was not only sight-seeing, but education by an exchange of ideas with Queensland farmers. They were here to find out our difficulties, and to try to work together in solving ours and their own problems.

"We compete with each other in various markets," said Mr. McIntosh, "but there is plenty of room for us all." It was a fact that a lot of New Zealand land carried a cow to the acre, and five to seven sheep. The secret was not so much good soil, but principally climate, regular rainfall, use of fertiliser, and humidity, which gave abnormal growth. He was astounded at Australia's low land values, wheat land here being about half the cost of that in New Zealand.

Visit to the Netherby Stud.

A visit was made to Mr. J. T. Scrymgeour's Netherby stud, on the Condamine River, close to Warwick. This stud was formed by Mr. Scrymgeour in 1922 with a nucleus of about half-a-dozen cows of pure Scotch blood. Netherby is a small compact freehold property of 305 acres of heavy arable black-soil land, fronting the Condamine River, and extending on to a lighter red-soil ridge, where the homestead stands. "Milton's Grandmaster" and "Heatherwick's Standard-bearer," together with about twenty-five head of aristocratically bred cows and ten choice heifers, form the herd. Practically all the females are from imported blood in the immediate crosses. A small but select stud of thoroughbred horses is also maintained on the property.

Mr. Scrymgeour is an outstanding figure amongst cattlemen of the Commonwealth. Though he is totally blind, as the result of a gunshot wound in the head

received while a member of the 2nd Light Horse Regiment during the great war, he is a very keen judge of cattle, possessing a wonderfully developed sense of touch, and is able to fault an animal where another, possessed of his full powers of sight, would overlook slight blemishes. He personally supervises and takes an active part in the working of the farm. Mr. Scrymgeour has few equals in his knowledge of Shorthorn pedigrees, and is a keen follower of the turf, particularly at Brisbane. With the aid of a wireless set he is fully informed of the winners each race day, and through the daily newspapers, which are read to him, he is kept well acquainted with the doings of the outer world. From the homestead at Netherby to the paddocks and cattle stalls an ingenious arrangement is installed for the guidance of Mr. Scrymgeour. It consists of overhead wires, running from the homestead to the various paddocks and stalls. A hollow metal cylinder is drawn across the wires by means of a length of rope, one end of which is attached to the cylinder, and the other end left hanging loose so that it may be grasped by the hand, and so guide a person when walking along. The business of the farm is conducted by him, and he types his own correspondence. Mrs. Scrymgeour, who is a very capable stock judge and a noted horsewoman, is his remarkably keen lieutenant.

At Toowoomba.

The rest of the day was enjoyed in a journey across the Downs to Toowoomba. The Mayor of Toowoomba and representatives of the Chamber of Commerce and primary industries travelled to Warwick to meet the tourists, and on the way back pointed out places of interest, and provided useful information pertaining to the district's primary products.

"I am greatly surprised at the extensive areas of wheat grown on the Downs and the absence of grassed areas," said Mr. Colin McIntosh, in the course of an interview with a press representative. He said it was the custom in New Zealand for farmers to plant, say, two crops of wheat, and then sow grass in order to give the land a rest. He was greatly impressed with the samples of Queensland wheat exhibited on the train, and was of the opinion that they would meet with great favour in New Zealand, as they were hard varieties,

For the first time in their lives the majority of the visitors viewed the Illawarra breed of cattle. Mr. McIntosh stated that it appeared to be quite a first-class dual purpose animal, and the Australian equivalent to the New Zealand milking Shorthorn. They were both suited to their own particular countries, and he did not think that any good purpose would be served by attempts to introduce the Illawarra into New Zealand.

Toowoomba Butter Factory.

Mr. C. Lynch, a member of the party interested in dairying, expressed delight at the up-to-date butter factory inspected at Toowoomba. It was beautifully clean and excellently managed, but he did not think that there was anything here to surpass the efficient machinery installed in New Zealand factories.

At Gatton.

The New Zealanders regarded their visit to the Queensland Agricultural High School and College on their way down from Toowoomba as one of their most interesting experiences since their arrival in this country. According to their leader, Mr. McIntosh, the visitors were greatly impressed with the useful and progressive work being performed there. Personally, he rather liked the idea of taking boys direct from the primary schools and allowing them to get their secondary education at the college. In New Zealand they found that boys who were sent to the city schools to complete their studies were loath to return to the land. They lost in some degree the agricultural bias essential to their livelihood.

AT SWIFT'S MEATWORKS

Among the many inspections made by the party of New Zealand farmers while visiting the eastern coast of Australia was that of the meatworks of Swift Australian Company Limited, Brisbane. The visitors were warmly welcomed by the Swift organisation, which spared no pains in explaining their entire system of operations, from the slaughtering of the various classes of live stock to the final preparation of the many edible and inedible products obtained.

At the termination of the inspection a hearty vote of thanks was accorded the members of the staff, and in response Mr. E. F. Sunners, manager of the company, stated that it was a great pleasure for the officials of the company to meet the visiting farmers, particularly when they evinced such a keen interest in the manner

in which the products of the land were handled through the secondary stage of production. That, of course, was a very important stage, and, wherever their plants were located, it was the policy of the Swift people to encourage a closer understanding between the producers of the raw material and themselves as manufacturers and distributors of the finished products. As they were probably all aware, the Swift distribution of meat and allied products is conducted on an international basis, and the Swift brand, and the high standard it stands for, is known world-wide. It would probably interest them to know that when the company began operations in Queensland, some sixteen years ago, it invested more than £1,000,000 in building modern works, and since then has purchased live stock to the value of about £15,000,000, and paid away in wages and supplies some £6,000,000. "We have at our disposal in the importing countries of the world a highly organised selling organisation, which can take good care of the products shipped to it from the various surplus producing countries where the company's slaughtering operations are conducted, and you, gentlemen," continued Mr. Sunners, "have seen for yourselves the efficient methods we employ in the preparation of our products and towards the elimination of waste."

Profits from Savings.

They recognised the principle that profits largely came by way of savings, and that low costs, together with high-quality goods and services, were the answer to practically all business problems. They were the means of getting the trade and holding it against all comers, and in the meat industry that condition could best be achieved through large-scale operations. They were perhaps aware, also, added Mr. Sunners, that there were important developments taking place which suggested that the future distribution of meat products would be by way of packaged goods, identifiable as to quality. So far as this country was concerned this method of distribution would possibly be in its best interests. To-day they shipped in the quarter or carcass and paid freight and charges on a good deal of bone and fat which had to be trimmed off before the meat was cut up for final distribution to the public. That material, if trimmed off at the works, could be put to valuable use in this country in the shape of animal foods and fertiliser, which would be badly needed in the production of the type of animals which the market now desires.

Market Requirements.

It was very important that producers should have full knowledge of the trend in market requirements, and that they should endeavour to accordingly change their production methods as might be necessary to meet that trend. It was a well-established fact that the present trend in meat consumption was very definitely towards meat from young, light-weight, well-finished animals. New Zealanders, particularly in regard to lamb, appear to be well informed in that direction, and they were practising those methods which enabled them to market the desired type, and that would enable them to continue doing so.

That was a safe position to be in, for this was an age when the consumer demand must be studied if the products of the land were to freely enter into the channels of trade, and quality counted to-day in all classes of products. This situation necessarily involved improved technique in all forms of primary production. In this State it would possibly involve a definite separation between the breeding and the finishing of live stock. They had an unlimited amount of suitable breeding country, but to-day they were lacking in the resources for fattening, which was the limiting factor to their production. In that direction, however, there were enormous possibilities for development within the reliable coastal regions, and he would say also that the future progress of primary production would depend more on the supply and proper use of fertiliser than on the supply and use of any other single resource, and live stock and larger acre yields were interlocking terms. The more the possibilities of that partnership were appreciated and developed, the more certainty would there be of producers earning profits, and the quicker would be the return to national prosperity.

AT BUNDABERG

Though Bundaberg was the most northerly point of their itinerary, the New Zealand farmers were able to form a favourable idea of the vitality of the Queensland sugar industry. At Nambour rain was pouring at the time of their stay. They saw something of the sugar as well as the fruit industry, but not enough to impress them with its importance. So it was not until they got to the

Bundaberg district that they were able to realise the vastness and value of sugar-growing in this State. It was unfortunate that they could not go further north where some mills had already commenced crushing. With that additional experience they would have been able to appreciate more the magnitude of the sugar industry and the general efficiency of its organisation. Notwithstanding excessively wet weather, they were able to follow the programme set out for them by the Bundaberg canegrowers, with the exception, unfortunately, of field operations. Mr. W. G. Gibson, of Bingera, had arranged cultural and other field demonstrations for their benefit, and which heavy rain prevented. The Sugar Experiment Station was missed for the same reason.

Fertile Cane Lands.

The New Zealanders expressed themselves astonished with the fertility of the cane lands around Bingera and in the Woongarra district, and commended strongly the evidences of sound farming practice on all sides. Their commendation was beyond the ordinary and polite conventions associated with such visits, for everyone of the party was a practical farmer bearing the marks of keen intelligence and hard toil. Earlier in their tour they had not hesitated to criticise cultural methods in other parts of the State, though often those criticisms were based obviously on an imperfect knowledge of Queensland conditions. The clean fields and green manuring crops flourishing alongside standing cane appealed to them particularly. When viewing the modern mill at Bingera with its massive machinery many of the visitors expressed amazement at the evidence of huge capital invested in the industry, while all were keenly interested in the milling processes as explained to them by members of the management, as well as the technical and engineering staffs.

A Heart to Heart Talk.

Local canegrowers were not slow in seizing the unusual opportunity of a heart to heart talk with farmers of the Dominion on some economical aspects of the industry. The visitors had already expressed their approval of the White Australia doctrine, and that formed the text of an appeal to them to consider the practicability of placing Queensland sugar on New Zealand dining tables. Though it was recognised that the Dominion requirements are supplied by Fiji, a British colony, it was suggested that when Fijian shipments fell short of New Zealand's needs, Queensland sugar should replace the Javan product.

In welcoming the visitors to Bingera, Mr. Gibson struck a strong note when he said that he hoped the day would not be far distant when New Zealand would be buying portion of Queensland's surplus yield instead of the black labour product from the islands. It would mean, if such an arrangement were made, that instead of having to export all the surplus over 13,000 miles, a big percentage would only have to cross the Tasman Sea. Queenslanders appreciated the fact that New Zealanders bought their sugar at a very much lower rate than the price ruling in this country. They import sugar from Fiji and occasionally from Java, and that sugar represented the produce of coloured labour. He urged a full measure of reciprocity between both Dominions. After emphasising the national aspect of the industry, and that concerned the Dominion as well as the Commonwealth, for the security of each was involved and the destiny of each must be commonly shared, Mr. Gibson added that as growers and millers they had established a high standard of efficiency, and applied science was making possible further developments.

Not a Spoonfed Industry.

The industry was not in any way spoonfed as had been suggested by certain interests in the South. In the Bingera area there were 410 suppliers, who, with their families, represented approximately 2,000 persons. In addition, Bingera employed 400 men. From those figures, applying to one Queensland mill, they could grasp the magnitude and importance of the industry. Mr. A. Bourke, their cane inspector, had covered 8,000 miles in the previous five months in the course of his work.

In the course of his reply on behalf of the New Zealanders Mr. C. McIntosh said that in the Bundaberg district they were seeing something entirely new to them. He, for one, was astounded at the quantity of machinery necessary for the production of sugar. On the White Australia policy he thought that was a matter on which the Commonwealth could be congratulated. The Federal authorities had taken the long view which would work out ultimately to the security of both Dominions. In New Zealand they had already a colour problem, for the fruit industry had passed into the control of Asiatics. He was especially impressed with

the fact that most of the machinery used in the Queensland sugar industry was manufactured in great foundries within the sugar belt; that showed that the industry was practically self-contained; it was also an example of the general progress which it made possible.

The value of these inter-dominion visits is strikingly obvious. Most of the New Zealanders were making their first journey away from the Dominion; they came with receptive minds and as shrewd observers they have gone away with a clearer idea of what the sugar industry means to Australia, and also, from the point of view of national security to New Zealand.

A Well Organised Tour.

The whole tour in Queensland was the last word in efficient organisation. Though the weather was excessively wet, especially on the near North Coast, there were no delays and no inconvenience. Mr. F. Pawson, representing the New Zealand Government, was the manager of the tour. The "Keso" train provided by the Queensland Railway Department was replete with every comfort. The Railway representative, Mr. A. E. Cole, proved himself an expert in modern transport. With the Railway Department was associated the Department of Agriculture and Stock, and two officers, Messrs. H. S. Hunter (Agricultural Branch) and J. F. F. Reid (Editor of Publications) accompanied the visitors throughout their tour.

The leader of the New Zealanders, Mr. Colin McIntosh, in the course of acknowledgments to the personal welcome his party had received from the Hon. Godfrey Morgan (Minister for Railways) and the Hon. Harry F. Walker (Minister for Agriculture), paid a tribute to the excellence of the arrangements made which enabled them to fulfil the purposes of an unforgettable visit to Queensland.

NERVOUS COWS AT MILKING TIME.

Milk secretion and milking is discussed by Mr. Stephen Bartlett, of the National Institute for Research in Dairying, in the Berkshire Milk-recording Society's Handbook. Some causes of variation in quantity and quality of milk are, he tells us:—

(1) Those causes which affect the speed at which milk is secreted or made in the udder between milking times.

(2) Those causes which tend to induce a cow to hold up a proportion of her milk at milking times.

Under the first heading it is known that secretion by many of the body glands is reduced by such things as insufficient food, ill-health or disease, fear, anger, and discomfort. Also there are other well-known factors which affect the speed of milk secretion, such as stage of lactation and age of the cow, as well as the point already mentioned, that secretion becomes slower as the quantity of milk in the udder increases.

Under the second heading one of the chief points to be noted is that the strippings of any cow are almost invariably rich in fat, sometimes being as rich as thin cream, so that retention of varying quantities of this rich milk will affect the quality of milk yielded by a cow more than it affects the quantity, and this can account for a considerable amount of the fluctuations which occur in the fat content of milk of cows from day to day.

It is possible that this holding up of portions of milk at milking time is associated with the differences in fat contents which occur between morning and evening's milk when unequal night's and day intervals occur, but since conclusive evidence cannot be offered, it is not desirable to emphasise the point. Since accumulated milk in the udder checks the rate of secretion, it will be obvious that milk retained at one milking will retard the rate of secretion before the next milking, and the effect of inefficient milking is to create a type of vicious circle which reduces milk yield.

If cows are always treated in such a manner that they never suffer any unnecessary discomfort nor have any reason to sense danger from their masters there is less chance of milk being held up at milking time. It is only reasonable to expect some cows to possess more uneven temperaments than others, and so one cow may be affected by a disturbance which another fails to notice. It has been found that milk secretion is not controlled by the nerves, for a cow can secrete milk when the nerves of the udder do not function, at the same time there is no doubt that during the actual milking process nervous control plays an important part, and unless a cow experiences a pleasurable sensation, free from fright, during milking time, it is unlikely that all the milk will be drawn.

QUEENSLAND BUTTER.

By CHAS. McGRATH, Supervisor of Dairying.

Subjoined is the text of an address delivered by Mr. McGrath at the Annual Conference of the Queensland Butter and Cheese Factory Managers and Secretaries' Association at Brisbane in June last. In the course of his address Mr. McGrath reviewed the position and the conditions of dairying in Queensland. He reminded his hearers that the pastoral, agricultural, and dairying industries represent the greatest actual and potential purchasing power in the Commonwealth. Through their efficient operation, they represent, too, the source of a strengthening current of finance that is vitalising the various groups of manufacturing and commercial activities.

FROM a perusal of the figures available it is learnt that the quality of butter produced for the year ending 30th June, 1930, will exceed that of the previous year, which was the peak year by some £2,000,000; the production of cheese will approximate that of last year, while the total value of the dairy products of the State for the year will be approximately £7,000,000 sterling.

The dairy herds of the State form the medium through which we recover this large amount of wealth by converting pasturage and fodder crops into milk. By such transmission the soil is not impoverished, but, on the contrary, by modern dairy methods it is left in a condition every year to continue to maintain or increase its productivity.

In this State and throughout the Commonwealth the return from grazing, dairying, and agricultural activities is the basis of our national wealth, and our future prosperity is directly associated with the conservation and improvement of our native pasturage, the maintenance of the soil fertility, the conservation of fodder, and the breeding of high class live stock.

The dairy industry is varied in its activities which include the milk supplies to cities and towns, the manufacture of butter, cheese, condensed milk, ice cream, and a variety of products obtained from casein.

There is evidence that in the near future the primary producers will give the matter of the city and town milk requirements more attention.

Food Value of Milk and Its Products.

As the comparative food values of milk and milk products become more widely known, these products will enter more largely into the daily dietary of the people than they do at present. The consumption of milk and butter is on the increase, but owing to the facilities offered residents of suburbs of cities and towns to keep a house cow, definite figures relative to the actual quantities of milk and butter produced from such sources are difficult to obtain. There are some hundreds of good type Jerseys, Australian Illawarra Shorthorns, and Ayrshires kept for household purposes by men engaged in activities other than dairying in cities and towns throughout the State.

The citizens of the State and Commonwealth are connoisseurs of dairy products, and only first grade dairy products are marketed in our own home markets.

The output of all the butter factories in this State is the product of pasteurised cream, and our choice butters have reached a high standard of quality.

As in dress so in dietary, the public taste undergoes a change as time wears on and the vast majority of the consumers now appreciate a sweet, mild, clean-flavoured appetising butter. The factory managements have responded to the demand and the market requirements are fully met by the output of the choice grade butter of factories throughout the State.

Oversea Market Requirements.

I availed myself of the opportunity of spending a forenoon on the grading floors with Mr. Pollard, a representative of the firm of H. Dean and Co., the well known firm of dairy produce merchants of London. From his selections of butter

it was evident that the market of the United Kingdom favours a sweet, clean, mild-flavoured butter possessing the characteristics of the butters that are placed in the premier position at the annual competition in Brisbane.

Butter possessing the desired characteristics is the product of clean, full-flavoured nearly-sweet cream, for from experience I know that the premier butter on the benches in this year's competition is the product of carefully selected cream possessing the characteristics mentioned, and have been made by skilled butter makers who have gained further honours for their companies and incidentally for the State.

The delivery of a high grade nearly-sweet cream is of vital importance to the industry and is dependent upon its production under hygenic conditions, with frequent deliveries to the factory.

Cream Transport.

The importance of organisation of transport from farm to factory will assist in improving the quality of the cream and make for increased efficiency in the conduct of factory operations.

Any dispute regarding the territorial rights of supply to factories should not be allowed to block the way to organisation of transport. Where disputes exist regarding the territory from which dairy factories should solicit supplies, the matter should be referred for settlement to a committee of three disinterested persons nominated by the chairman of directors of the dairy companies operating in the division of the State where the dispute exists.

Interstate Boundaries.

Through the activities of the State Boards associated with the industry, the interstate boundaries have been effaced as far as they pertain to the operations of the dairying industry, and the good will which now exists among dairymen throughout the Commonwealth ensures an improvement not only in their material, but also in their social welfare. The time for settlement of minor inter-factory differences or misunderstandings is overdue.

Quality of Butter.

Co-operation with the officers of the Commonwealth Grading Division enables State officers to examine and grade all the dairy produce submitted for export; and, in conjunction with the examination and grading of dairy products intended for interstate and local markets, affords the State officers an opportunity of forming a comprehensive and reliable opinion on the quality of the dairy products manufactured in the State. The system allows of a comparison being made of the quality from year to year, and of the influence of seasonal conditions on the products of the industry.

From a review of the reports by the Chief Grading Officer for Queensland, Mr. G. H. Heers, it is learnt that a general improvement has taken place in the quality of the butter and there is a greater degree of uniformity.

Manufacturing faults are infrequent, and this is due to the fact that the great majority of factories have installed modern efficient manufacturing plants. Generally the body, texture, and condition of the butter marketed is evidence of the efficiency of the men who are responsible for its manufacture.

During the summer, floods that occurred in sections of the dairying districts prevented regular deliveries of the cream, and this accounted largely for the quantity of inferior butter manufactured.

While there has been a general improvement in the quality of the butter produced during the year, I wish to stress the necessity of increased effort on the part of all associated with the industry, with a view of maintaining a high standard of quality and of using every endeavour to eliminate the production of low grade products.

A review of the work of the butter graders during the year indicates that the cream graders at some of the factories are passing into choice and first grades a proportion of cream that is not up to the standard quality of the cream with which it is pooled. "Border" cream" is a term applied in cream grading to

a product of doubtful character. The term implies that on a quality determination it is in the line of division between two grades, and the tendency is to class it with the higher of the grades.

A trained and experienced grader, by the exercise of care on the grading floor, and by keeping in touch with the results of his work as disclosed by an examination and grading of the butter produced from the graded cream, will be enabled to classify the cream according to its quality and do justice to all producers.

The cream grader is entrusted with most important duties, and on their proper performance depends to a very great extent the welfare of the factory and the producers associated with it. If cream be put into a pool with a product of a higher grade, the supplier of the higher grade product is deprived of a portion of the return to which he is entitled. By careful grading a premium is paid for quality, and it is only by paying a premium for high quality can we expect to obtain quality.

The quality of the butter is influenced to a great extent by the care and attention given to its production and handling on the farm, and the reputation of a factory's management and staff suffers in proportion to any inefficiency which may exist in the grading and manufacturing departments.

Modernly equipped dairy factories make provision for the handling and processing of the cream so as to ensure that the butter produced will be of the highest quality that can be obtained from the cream treated.

Pasteurisation.

Attention to detail and efficiency in carrying out the processing of the cream are essential in order to obtain the benefits of pasteurisation. The flash system is installed in practically all the factories of the State. The batch system serves a few factories of small output.

The importance of subjecting all portions of the cream to effective temperatures cannot be too strongly stressed, and provision should be made so that when desired the cream leaving the pasteuriser can be returned to the bulk cream tank and enable the processor to carry out his work efficiently. Should a portion of the cream pass from the pasteuriser to the cooler without being subjected to the required temperature, it would recontaminate the bulk cream in the holding vat. Other sources of recontamination of the pasteurised cream are unclean cream coolers, pipes, holding vats, churns, packers, and contaminated wash water. Provision should be made to facilitate the cleansing and sterilising of all portions of the plant and utensils with which the cream and butter comes in contact.

Surface Taint in Butter.

Realising the necessity of eliminating a surface defect in butter, which may be confused with a flavour taken up by the surface of butter which is in proximity to unseasoned timber, a committee consisting of Messrs. C. F. McGrath (Supervisor of Dairying), G. H. Heers (Senior Grader), J. C. Brünnich (Agricultural Chemist), E. C. Tommerup, B.Sc., C. J. J. Watson (Forestry Department), C. J. Pound (Government Bacteriologist), F. W. Uhlmann (General Manager, Caboolture Co-operative Dairy Association), and D. Saxelby (General Manager, Queensland Farmers' Co-operative Dairy Association), representatives of the Factory Managers' Association was appointed by the Minister for Agriculture, Mr. H. F. Walker, to ascertain the cause of the defect and suggest remedies for its elimination.

Exhaustive experiments were carried out with varieties of timber used in the construction of butter boxes within the Commonwealth. Two members of the committee, Messrs. Heers and Uhlmann, visited New South Wales and Victoria to ascertain if the defect were peculiar to the butter manufactured in this State. It was found that a defect of a similar character was existent in the product in both the Southern States. In carrying out their investigations, the co-operation of the State and Federal officers was readily forthcoming.

In testing the suitability of various timbers as butter containers, exhaustive tests were made and will be fully dealt with in a report to be furnished by the committee when further investigations which are now proceeding are completed. Results of the experiments, relative to the influence of the timber used in the construction of butter boxes on the incidence of the defect, justifies the committee in arriving at the conclusion that Queensland Hoop Pine and Kauri Pine are second to no other timber used in the experiments.

The following timbers were used experimentally:—Queensland Hoop Pine and Kauri Pine, New Zealand White Pine, Grey Satinash, and Silver Quandong.

Moisture Content in Butter.

The standardisation of the moisture content of the butter does not receive in a few cases the attention that its importance warrants, for several brands of butter vary considerably in moisture content. Determinations of the moisture should be made at intervals during the working of the butter and so ensure a content of approximately 15.75 per cent.

Deodorisation of Cream.

A decided improvement in the quality of butter was noticeable from those factories which had installed cream deodorisers. The process is found beneficial in removing volatile and volatilable feed odours and flavours and, by increasing efficiency of the process of pasteurisation, adds to the keeping properties of butter. It will not convert an old, stale, fermented cream into a first grade substance. The expense of so processing such low grade cream is not covered by any improvement in the quality of the product.

Improvement of Factory Buildings and Equipment.

At no previous period in the history of the dairying industry has the matter of improvement of dairy factory buildings and equipment received the amount of attention that has been given during the period under review.

Large factories constructed of concrete or brick and supplied with the most modern dairy factory equipment have been completed or are under construction in dairy centres in Southern and Central Queensland.

The opening of a modern butter factory at Toowoomba in May last was associated with conferences of the several Boards functioning under the provisions of the Primary Producers' Organisation and Marketing Acts. Official representatives of the industry from all the States of the Commonwealth attended to confer on matters of vital importance to all associated with the industry throughout Australia. Facilities were afforded the visitors to see a large area of the Downs, and one and all were greatly impressed with the fertility of the expansive Darling Downs Tableland. In their association with the opening of the Downs Co-operative Butter Factory at Toowoomba they voiced their admiration of the optimism of the directors of the company in establishing a large modern factory, and leaders of the industry from other States who recently toured the dairy centres overseas pronounced the new factory and equipment to be second to none in the dairy world. A large modern butter factory is nearing completion for the Port Curtis Co-operative Dairy Association at Gladstone, which on completion will be worthy of similar commendation.

The holding of the conference of the members of the Executive of Boards associated with the industry in centres of dairying activities is commended, for by so doing information is obtained that assists them in carrying out their important duties.

The Future.

It is significant that organised dairy farming is now recognised on the part of the Government and by commercial and industrial groups as a vital economic factor in the progress and prosperity of the Commonwealth. I say, advisedly, dairy farming conditions as they existed prior to the closer organisation of the industry were such as to deter the settlement of the rich agricultural areas of this State, which are now dotted with the homesteads of progressive agriculturists and dairy farmers.

Grazing, agriculture, and dairy farming represent the greatest potential purchasing power of the Commonwealth. The financial returns from such sources are made available for the further development of rural areas, and the improvement, construction, and equipment of manufacturing units, thereby creating a strengthening current of finance to vitalise the various groups of manufacturing and commercial activities.

The outstanding factor that inspires confidence in the future is the strength of the co-operative control ensuring recognition of a policy in the best interests of the industry, efficiently carried out by the various controlling boards.

Agricultural and dairying activities differ from some other groups in that the returns therefrom are largely invested in the products of various industrial activities which by increasing the volume of employment and thereby stimulating trade adds to the prosperity of the people as a whole.

PINEAPPLE CULTURE.

NOTES ON MANURIAL EXPERIMENTS.

The Director of Fruit Culture, Mr. George Williams, has supplied the following notes of some manurial trials carried out on the Pineapple Experimental Plot at Elimbah.

Area: Half acre. Soil: Light loam—grey to light brown. Treatment: Quarter area subsoiled with gelignite. Air slaked lime applied to ¼ acre, pulverised lime on ¼ acre in October, 1928.

Maize was planted for a green crop and ploughed under in February, 1929. The final ploughing prior to planting was from 9 in. to 12 in. deep. The plots were planted with gill sprouts at the end of March, 1929. Paper mulch was used in three rows. Fertilisers were applied to fourteen rows; two were untreated.

Inspection twelve months after planting shows a distinct advantage in favour of potash; in fact; the most promising row had been treated with potash sulphate only. Phosphates including bone dust showed no appreciable results. Dried blood improved the colour of the foliage and to some extent stimulated growth. When associated with potash the colour of the foliage was improved without appreciable increase in growth above that where potash alone was used. To the soil occupied by two rows, calcium cyanide was applied before planting with the object of destroying nematodes if present. The plants showed no benefit.

Three rows planted through paper mulch do not in this particular class of soil show any resultant benefit. The experiment is being continued, further applications of fertiliser having recently been made. It was noted before planting that a portion of the plot required draining, and this is now more reflected in the plant growth. Necessary drainage is now being considered and this practice will, it is expected, result in a marked improvement on next season's growth.

Detailed information is shown in the following table:—

Plot: Fourteen Double Rows—9 ft. (Centre to Centre) apart, 50 yards in Length.

Row Number.	Nauru Phosphate.	Sulphate Potash.	Dried Blood.	Bone Dust.	
	Lb.	Lb.	Lb.	Lb.	
1 ..	..	..	..	..	Check ; poor growth.
2 ..	24	..	..	..	Soil treated with calcium cyanide ; no improvement.
3 ..	24	..	..	..	Paper mulched ; poor growth ; pale foliage.
4 ..	..	..	20	..	Growth improved ; of good colour.
5 ..	..	16	20	..	Growth fair ; even ; rather pale.
6 ..	..	..	..	40	Paper mulched ; poor ; pale growth.
7 ..	..	20	..	..	Good growth ; fair colour ; best row.
8 ..	18	..	18	..	Medium growth ; good colour.
9 ..	16	18	14	..	Paper mulched ; variable ; fair to good.
10 ..	20	24	18	..	Fair growth and colour.
11 ..	..	24	18	40	Fair growth and colour.
12 ..	14	20	16	..	Paper mulched ; soil treated with calcium cyanide ; poor growth.
13 ..	12	..	..	30	Poor weak growth.
14 ..	..	..	..	..	Check : poor condition.

Rows 1 to 9 soil trenched with explosive.

PLATE 51.—ROW NO. 3. PINES PLANTED THROUGH PAPER MULCH.

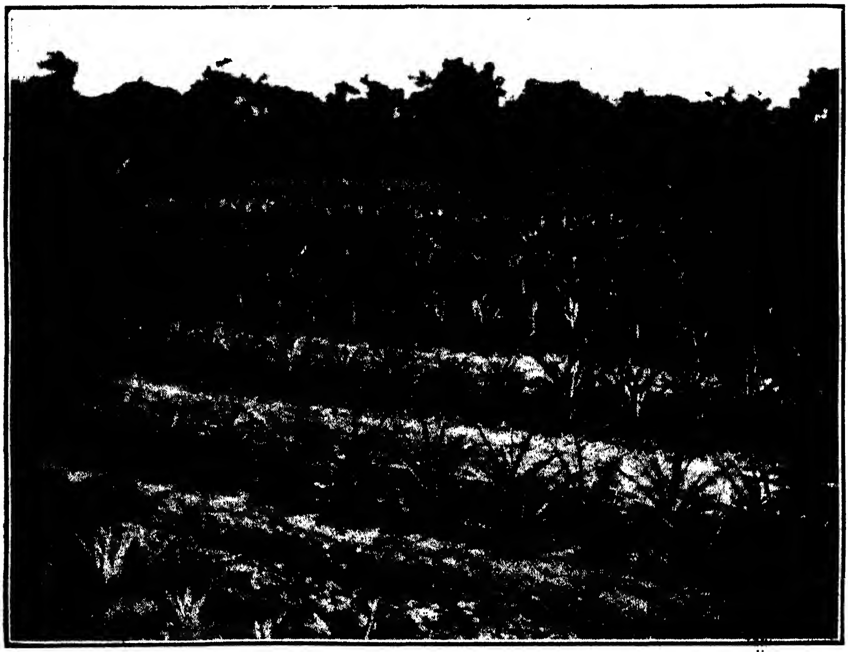


PLATE 52.—A FIELD IN NEED OF DRAINAGE.

Plate 53.—Row No. 7. Row Treated with Potash (20 lb.) only.

Plate 54.—General View of Plot.

WINTER SCHOOL FOR PIG FARMERS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

Covering a fortnight's residence at the Queensland Agricultural College, at Gatton, and including both practical and theoretical training, the third of a series of schools of instruction for farmers, and their sons, interested in the breeding, feeding, and management of pigs, concluded early last month. Though the attendance was smaller at this than at former schools, the reduced number in no way indicated lack of interest, but was entirely due to abnormal weather conditions, heavy rain and, in some districts, floods a few days before the school opened, necessitating cancellation of arrangements by other farmers who had intended being present.

This year's school was marked by even keener interest and application, and the students as a body reported that they had thoroughly enjoyed and much appreciated the opportunity provided of attending such an important course of training. Mr. W. Koehler, of Yamsion, Dalby, who was elected president of the school committee, said that the school would have a vast influence in creating greater interest, leading to considerable improvement in the type of pigs bred and marketed in Queensland. His own experience in attending the lectures and practical demonstrations was that he had been enabled in the two weeks at the College to learn much more about pig farming than he had thought possible in such a comparatively short course. Professor J. K. Murray, B.A., N.D.D., Principal of the College and Professor of the Chair of Agriculture at the Queensland University, addressed the students on several occasions and gave a most interesting series of talks on "Bacteriology and the use of the Microscope," and also on the "Principles of Feeding, Balancing of Rations." The value of these schools of intensive instruction is highly appraised by the Principal, and already several other important schools have been held including Tractor Schools, and Dairy Factory Employees' Schools.

Mr. A. J. Mackenzie, Lecturer in Animal Husbandry, was present throughout and gave a number of valuable lectures on Diseases of the Pig, on Improvement of Breeds, and on Anatomy, Physiology, and other phases of animal husbandry.

Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, and Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, were also present and dealt both in lectures and practical demonstrations with the subjects of Breeds of Pigs, Housing and Accommodation, Design and Construction of Piggeries, the Selection and Judging of Breeding Stock. These lectures were also illustrated by lantern slides. The evening sessions were also attended by the regular College students.

Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture and Stock, discussed, in an informative way, ways and means of "Putting More Money into the Farmer's Pocket." The students would have liked Mr. Reid to have enlarged on this subject and on economics generally, but time did not permit. The "Parasites of Livestock" were discussed and illustrated by Mr. F. H. S. Roberts, M.Sc., recently appointed Veterinary Parasitologist in the Agricultural Department; while Mr. C. T. White, Government Botanist, dealt very fully, in a practical demonstration, with the question of Poisonous Plants and Weeds. To indicate ways and means of keeping piggeries in a more hygienic condition and in a manner that will be satisfactory to Departmental Inspectors, Mr. H. G. Cheeseman, Senior Slaughtering Inspector, attended and spent a very useful hour with the class. Mr. C. J. Pound, Government Bacteriologist, dealt very fully, both in a practical talk and in an illustrated lecture, with Tuberculosis in Pigs and Other Stock, and with the use of Disinfectants. These lectures are always of interest and value, and have an important bearing on the management of farm stock.

By means of a cinematograph film and in an informative talk, Mr. R. G. Watson, Chairman of the Queensland Pig Industry Committee, and Secretary of the Queensland Bacon Curers' Association, dealt with Commercial Pig Farming, and indicated the procedure on his own pig farms at Kingston and Beaudesert, where more than 800 pigs are kept and fed on buttermilk and farm-grown foods, with commercial foods purchased from outside sources. Mr Watson, in his capacity as President of the Australian Stud Pig Breeders' Society, also briefly reviewed the activities of that body and of the Queensland Branch which now has more than 100 members.

Mr. A. G. Aitchison discussed the Home Project Schemes in which the Departments of Agriculture and Stock and of Public Instruction are co-operatively interested, and illustrated boys and girls at work in country Pig and Calf Clubs, Poultry Clubs, and other activities of special interest to the junior farmer.

Mr. Woodward, of the College staff, dealt with Farm Bookkeeping, and Mr. Graham with Fodder Crops, Soils, and Agricultural Machinery. Mr. Bosworth, of the staff, also discussed Agricultural Education and the Growth of Co-operative Societies. The practical demonstrations included lessons on castration, killing and dressing porkers, and post mortem work generally. Some time was spent in inspection of the stock, and discussion on the Pig Breeding Experiments at the College

PLATE 55.

Members of the School of Instruction for Pig Farmers at Gatton College, Queensland, July, 1930.

Piggery, where between 500 and 600 pigs are kept. For the information of all concerned Mr. J. P. Bottomley, Treasurer, and Mr. H. W. Watson, Secretary of the Royal National Agricultural Association, Brisbane, reviewed the activities of that organisation and discussed the Pig Section Classes at the Brisbane Exhibition, Queensland's great livestock show.

In the course of the sessions of the school, the members of the Queensland Pig Industry Committee attended to hold their monthly meeting, and inspect the stock in the Pig Breeding Experiments in which they also are interested. On this occasion opportunity was taken by the members to discuss with the school questions relating to the marketing of pigs and to the urgency of increasing local consumption of Queensland pork products.

An hour was spent each evening in asking and answering questions and in general discussion of various topics, while the weekly picture show and a breaking-up social concluded a very interesting course of instruction to which a much larger attendance is expected next year.

Those attending the course included:—L. Caulley, Sexton, via Miva; D. J. Gillespie, Wynnum South; H. Fox, Cushnie, Tingoora; J. S. Wengert, Cushnie, Tingoora; W. Koehler, Yamsion Stud Piggery, Yamsion; S. G. Knight, Ballgamon, Nanango; Len Storey, Kingsthorpe; H. Mansbridge, Greenmount; J. S. Porter, "Gallangowan," Nanango; H. B. Taylor, Monal Creek; P. Kajewski, Glencoe, Gowrie Junction; M. J. Brosnan, Headington Hill, Clifton; A. Kerle, Rosevale, Kalbar; and F. Wright, Rosewood.

In addition, three special course college students and three University students attended certain of the lectures and demonstrations and were present on the occasion of the visit to the bacon factories.

IMPORTED PEDIGREE SOWS.

There arrived during the week ending 6th July, 1930, from New Zealand, two Large White sows from the stud of Mr. C. S. Mexted, Te Kawa. One sow is for Mr. R. G. Watson, of the Kingston Pig Farm Company, and the other is for Mr. J. A. Heading, of Murgon. These two sows are full sisters. One sow took first prize at the Hamilton and Otorohanga Shows and the second at Auckland, while the other won second prize at the first two shows and first prize at Auckland. They are by Tamaki Canadian Sargeant (the North Island Champion boar) from the famous sow College Y 745 (imported from Canada). This sow won with outstanding honours in Canada and since going to New Zealand has been shown three times, gaining three firsts and two championships. The sows imported to Queensland are in pig to Tamaki Major. This importation introduces to Queensland some of the best blood of the Large White breed obtainable in the Southern Hemisphere and, as the breed has been recommended by all countries that have conducted inquiries into the pig industry, these sows, together with introductions by the same stud masters from Victoria, should be a decided acquisition to the stud pig industry of Queensland.

IN FAVOUR OF THE LARGE WHITE PIG.

Writing in support of the Large White pig (also called the Large Yorkshire and the Large White Yorkshire), a prominent Southern breeder states this breed has made rapid headway in Victoria.

Seven years ago there were only two studs of the breed in that State, whereas to-day many of the leading breeders are turning their eyes towards this famous old British breed, and there are numerous very high-class studs from which suitable stock could be secured. By many they are considered the best bacon-producing pigs in the State, and not only the best but the most economical producers of high-quality bacon. They are very early-maturing, and are ideal as baconers on account of their long, deep sides which do not carry too much fat, as many other types do, and which on that account in other countries are often referred to as "lard" breeds. The texture of the Large White bacon is fine and, being early-maturing, it is more succulent and palatable than the slower-maturing types, and also more suitable for Australian requirements. The Large Whites are splendid pigs for crossing purposes, and in that respect have been the means of greatly improving many common herds of pigs from a bacon-curer's standpoint. They are readily sought, and invariably bring the highest prices at pig sales. Baconers have been sold for the farm of the breeder referred to at the age of eighteen weeks, whereas twenty-two weeks had been the best for any other type weighing 130-140 lb. These records have often been exceeded overseas, where also the breed is extremely popular.

CLIMATOLOGICAL TABLE—JUNE, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·99	79	64	85	1	54	29	340	3
Herberton	..	70	50	76	16	34	20,21	57	5
Rockhampton	30·07	71	55	77	7	45	5	1,047	13
Brisbane	30·13	68	54	74	1	41	9	758	16
Darling Downs.									
Dalby	30·15	64	47	72	22	28	9	236	10
Stanthorpe	..	57	43	65	20	19	9	470	19
Toowoomba	..	58	46	65	21	31	9,30	831	17
Mid-interior.									
Georgetown	29·99	80	51	86	9	36	18	5	1
Longreach	30·10	70	48	79	29	41	17	15	3
Mitchell	30·15	62	44	70	23	28	10	184	14
Western.									
Burketown	30·03	80	56	85	10,27	49	18,19	0	0
Boulia	30·11	74	46	80	26,28	38	21	0	0
Thargomindah	30·16	63	47	71	26,27	37	9	30	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JUNE, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. June.	No. of Years' Records.	Total Rainfall. June, 1930.	June, 1929.	Divisions and Stations.	Average Rainfall. June.	No. of Years' Records.	Total Rainfall. June, 1930.	June, 1929.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	1·61	29	1·14	1·29	Nambour	3·62	34	18·54	3·08
Cairns	2·78	48	3·40	2·60	Nanango	2·06	48	5·07	1·38
Cardwell	2·04	58	0·70	1·46	Rockhampton ..	2·38	43	10·47	10·39
Cooktown	2·00	54	4·00	2·02	Woodford	2·87	43	14·56	3·52
Herberton	1·04	43	0·57	0·87					
Ingham	2·34	38	2·92	1·60					
Innisfail	7·04	49	11·26	4·09					
Mossman	2·63	17	2·29	1·76	*Darling Downs.*				
Townsville	1·32	59	1·37	2·03					
					Dalby	1·70	60	2·36	1·15
					Emu Vale	1·53	34	3·75	2·73
Central Coast.					Jimbour	1·73	42	2·18	1·41
					Miles	1·83	45	2·24	0·75
Ayr	1·45	43	1·71	3·24	Stanthorpe	1·92	57	4·70	1·65
Bowen	1·61	59	3·28	1·81	Toowoomba	2·42	58	8·31	1·38
Charters Towers ..	1·30	48	1·86	1·76	Warwick	1·78	65	3·23	1·91
Mackay	2·68	59	3·07	2·41					
Proserpine	3·37	27	6·57	2·49					
St. Lawrence.. ..	2·49	59	7·77	6·87	*Maranoa.*				
					Roma	1·64	56	1·28	0·61
South Coast.									
Biggenden	2·17	31	7·01	1·97					
Bundaberg	2·84	47	8·76	3·36	*State Farms, &c.*				
Brisbane	2·85	79	7·58	4·40					
Caboolture	2·66	43	12·37	3·45	Bungeworgorai ..	1·48	16	1·34	0·43
Childers	2·48	35	8·70	1·38	Gatton College ..	1·87	31	5·93	1·47
Crohamhurst ..	4·44	37	21·36	4·66	Gindie	1·52	31	1·61	2·91
Esk	2·23	43	9·95	3·05	Hermitage	1·90	24	2·84	1·78
Gayndah	1·85	59	4·04	1·07	Kairi	1·46	16	0·86	1·42
Gympie	2·67	60	10·69	2·63	Mackay Sugar Experiment Station ..	2·38	33	3·38	2·54
Kilkivan	2·14	51	5·63	0·97	Warren	2·56	15	..	6·28
Maryborough ..	3·00	58	11·37	2·55					

GEORGE G. BOND, Divisional Meteorologist.

CONTAGIOUS ABORTION.

By J. A. RUDD, L.V.Sc., Veterinary Surgeon, Department of Agriculture and Stock.

THE special treatment of dairy cows for abortion depends largely as to whether it is (i.) Contagious abortion (*a*) Curable, (*b*) Incurable; (ii.) Sporadic abortion; or (iii.) Troubles after calving.

(*a*) Contagious abortion may be curable if it is due to the bacillus coli, provided certain very definite steps are taken to prevent its spread, such as isolation of aborting cattle for at least three weeks and the flooding of the uterus with permanganate of potash, 20 grains to each gallon of sterile water.

If the placenta or cleanings are not voided, the following drench will assist in causing expulsion of the placenta:—

Epsom salts	12 oz.
Carbonate of ammonia	1 oz.
Powdered gentian	1 oz.
Powdered ginger	1 oz.
Treacle	1 lb.
Water	1 gal.

After the lapse of twenty-four hours, syringe out or flood the uterus by gravitation with the above solution if the placenta has been voided, if not repeat the drench. This is very seldom necessary.

(*b*) Contagious abortion due to the bacillus abortus is incurable and is very serious indeed. Adopt the foregoing treatment and, in addition, isolate the cow for six weeks after calving or after she has aborted, and dispose of the foetus and placenta by fire if possible. The discharge from the uterus is highly contagious and generally persists for about four weeks after calving.

The proper method is to differentiate from the first by means of a blood test, and if the test is positive the best plan is to spey the cow and fatten her for the butcher.

How Infection is Spread.

The method of infection is chiefly through the mouth, and the predilection seat is the uterus if the cow is in calf, and if not the mammary gland where it remains until the cow becomes pregnant and then it enters the uterus. Cow licking a cow which has aborted. The exudate from the septic uterus draining down the thighs and tail becomes spread about the body through the agency of the tail, and it may even reach the bodies of other cows in this way. The bull may also carry the organism and infect a cow during copulation, and when the cow aborts the bacillus gravitates to the mammary gland. The placenta and foetus is capable of infecting a cow after it has laid out in the paddock exposed to climatic changes for some months, even up to eighteen months as proven by experimental evidence.

The Blood Test.

The blood test for contagious abortion can be carried out at the Yeerongpilly Stock Experimental Station, where information as to drawing the blood for the test may be obtained.

Seriousness of the Disease.

Contagious abortion caused by infection with the bacillus abortus is very serious because it is directly responsible for—

(i.) Ninety per cent. of all the in contact or infected cows of a herd aborting.

(ii.) Thirty per cent. of sterility among the aborting cows of the same herd.

(iii.) Possibility of a large percentage of cows not holding to the bull at first service.

(iv.) Sterility among bulls in the affected herd.

(v.) Losses from white scour of 70 per cent. of calves born of recently infected parents which carry a relative immunity to the disease. Calves from these infected parents are frequently born with white scour.

(vi.) Septic pneumonia of calves born of infected parents which carry a relative immunity which is practically incurable.

(vii.) Infection from these calves is very liable to spread to healthy calves born of parents which are free of this disease.

(i.) The statement that 90 per cent. of the cows abort when a herd is infected with the Bacillus Abortus of Bange may probably be considered high, but it is fairly constant if the abortions which prevail in the herd during the first two years after the first cow is a proven aborter is taken into consideration.

(ii.) *Thirty per cent. sterility among aborting cows.*—It is during the first three years after the first cow has been proven a contagious aborter in a herd that this second trouble arises, but unfortunately it does not end there. Even with the greatest care in after treatment, which is more than the average farmer can possibly spare the necessary time to carry out, it gradually extends to the best producers in the herd, and this for no apparent reason. There will be found, too, some cows in the herd which have never been known to abort, but for some unknown cause they will not prove in calf.

(iii.) The possibility of a large percentage of cows not holding to the bull at first service, but coming back repeatedly even when a fresh bull has been introduced into the herd, is always present. This may easily prove disastrous in a pure herd, for all blood lines of a particular strain may thus easily be lost for ever and the ultimate objective of the breeder shattered almost to despair.

(iv.) *Sterility among stud bulls in the affected herd.*—It has been repeatedly stated that the bull is not a carrier, even if infected by the Bacillus Abortus of Bange. If such is true, how then is it possible to find nests of this same bacillus abortus in the epididimi of the testicles of infected bulls, which readily react to a blood test for the bacillus abortus, and how is it that such a bull can, if he is not badly infected at the time of mating, serve and stint clean cows which are not infected and which abort four months after being stinted, not having up to that time been in contact with any infected cattle? This is fairly clear proof that a bull can carry the bacillus abortus and spread the disease. Therefore, the wandering bull which is to be found in all the dairying districts of this State should not be tolerated. How often does a careful dairy farmer find his own bull secure in his bull paddock and his neighbour's bull following his herd into his yard, and perhaps his best stud cow in calf to a useless bull of doubtful pedigree?

(v.) *White scour among calves born full time of parents which have a relative immunity to contagious abortion.*—This is fairly constant among such calves, and I have known cases which were affected with white scour at the time of birth. This disease in these calves is not only hard to cure, but when they are cured they do not prove to be regular breeders when mature. At best they are only fitful breeders and are more often running in the paddock half fat than producing at the pail. When they are milking and come into oestrum and mated to a proven bull they do not come on again, but give the impression that they have been stinted and at the lapse of nine months, when they should be calving and coming into profit, they upset calculations by coming in to oestrum again being served and perhaps stinted for the second time in eighteen months. Others again come on regularly every twenty-one days as heifers, and never seem to hold to the bull and remain to be ultimately fattened for the butcher.

(vi.) Septic pneumonia of calves born of parents carrying a relative immunity to the contagious abortion bacillus is not very common, but once it makes a start it runs through a herd of calves, whether they are the offspring of contagious aborters or not. It makes a clean sweep, and unless vigorous measures are practised the whole crop of calves for that particular season is wiped out. Therefore, it is not advisable to purchase calves indiscriminately or introduce them into a healthy herd of calves from outside sources in case they carry infection into the herd.

Sterility among dairy cows which have never aborted and are not positive to the test for contagious abortion may be due to the abovementioned causes, although there is no known means of ascertaining the truth. But if it is possible to trace back their ancestry, it will be found that contagious abortion due to bacillus abortion is responsible for their sterility, either partially or wholly, as it affects them to a greater or lesser extent.

INTRODUCTION OF THE STUD BULL.

No fresh bull or cow should be introduced into a clean herd without going through the blood test for contagious abortion. It is possible to do this without the assistance of a qualified veterinary surgeon by getting into touch with the Yeerongpilly Stock Experimental Station, or either of the Commonwealth Government Laboratories at Rockhampton or Toowoomba at a very small cost. The intro-
not advisable to purchase calves indiscriminately or introduce them into a healthy herd
duction of a fresh bull should not be seriously considered without the test for tuberculosis, and the cost of the services of a qualified veterinary surgeon should be the first cost on the price of the bull.

Not long since, a bull on the North Coast was responsible for the introduction of contagious abortion into a clean herd of cattle, and all the trouble would have been saved if a blood test had been carried out before the bull was introduced into the herd.

Immunity and Relative Immunity.

Immunity means that an animal once it is infected with a disease and recovers never has a recurrence of the same disease, but is immune to this disease for the rest of its life.

Relative immunity means that an animal, once it is infected with a disease and recovers from the disease, may during its lifetime have a recurrence of the same disease, i.e., it is not a lasting immunity. With contagious abortion the animal carries a relative immunity and, in addition, remains a carrier of the disease during its lifetime and may have a recurrence of the disease in a virulent form.

SPORADIC ABORTION.

Sporadic abortion is not contagious and may be due to accidents which cannot well be avoided. Lack of phosphates in the soil, and feeding on mouldy fodder may be cited as some of many causes.

The treatment already given will answer the purpose and bring the cow back to health and in due time she will recover her normal state.

TROUBLES AFTER CALVING.

Ninety per cent. of the post-calving troubles are due to neglect of simple precautions, and the crude methods involved in dealing with the calves. The calves should be allowed to run at least for two days with their dams, as the sucking action of the calf assists in the contraction of the uterus or calf bed, and the rapid expulsion of the contents of the uterus and the return to normal of this important organ of reproduction assists the general health of the animal concerned, and gives her an opportunity to render useful service at the bucket. The calf should be at least easily accessible to the cow for the first six weeks after calving. So long as she can see her offspring she appears satisfied and content, but the call of the hungry calf which is very distressing does at all times upset the mother. There are some cows, and not always the best, that take little notice of their offspring, being more concerned with their own petty troubles. The cow which should be encouraged is one which makes it a practice of making the care and well-being of her calf a matter of constant concern, for the maternal instinct is strongly developed and, proportionately, her ability to do well at the bucket and conceive regularly at certain given intervals is greatly increased. At least for the first seven days after calving a good mother is always within earshot of her calf, and she should be allowed this as it is her natural right. If a cow has calves normally and there is little or no discharge, it is a grave mistake to interfere with her at all in the way of flooding the uterus and, except for cleansing of her tail and brush and back of the udder and perhaps the udder itself with good soap and water as soon as the calf is taken away, she should be left severely alone.

The clipping of all hair in and around the udder as far forward as the navel should be practised as a routine work on every dairy farm, for the long hairs collect the filth and predispose the large, well-developed udder to mastitis which is usually contagious.

Flooding of the uterus with blood due to hæmorrhage may take place nine days after calving, and although this is not a constant symptom it does occur and, provided it is not excessive, it could well be left alone. The calf should be fed, if possible, on mother's milk for at least three weeks before being placed on the mixed milk ration.

Septic Pneumonia Among Cows.

Septic pneumonia among aborting cows or cows which have a relative immunity to contagious abortion and have recently come into profit, or are in contact with contagious aborters is fairly common, especially among the best heavy producing cows, and frequently the response to treatment is not all that can be desired, and consequently the percentage of deaths among these cows is fairly high. On the outset of septic pneumonia the affected cows should be isolated and treated away from the main herd, and prompt action is necessary if satisfactory results are to be assured. The cows should be placed under cover, well bedded down, have easy access to ample clean water in the stall, and the services of a qualified veterinarian obtained and steps taken to bring about rapid recovery, for if the case hangs fire the profit for the year is completely lost even if the cow survives.

On the Modern Farm
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THE CARE OF THE CAR.

The Magneto and the Spark.

It is not unusual to hear a motorist boast that he has run 10,000 miles or more and never looked at a spark plug or had to touch his ignition system in any way.

The motorist who remembers the ignition systems of a few years ago marvels at the reliability of modern ignition systems, no matter whether they be magneto or battery and coil systems. The history of the development of the ignition system used on modern cars is of little practical value to the modern motorist, but is of interest.

The motor engines made in the last few years of last century were weird and wonderful arrangements, yet they were essentially the same as modern engines with the exception of the ignition and carburettion systems.

The "Hot Tube."

Thirty years ago very little was known of electricity and on the engines of those days various sorts of ignition devices were used. A somewhat successful type was the hot-tube ignition. This system consisted of a small tube fitted into the cylinder head. The tube was heated by an external lamp until the interior of the tube was red hot. The tube was isolated from the engine by means of a small valve, but when the mixture was compressed the valve opened and allowed the inflammable gas into the hot tube where it immediately ignited and the flame immediately blew back into the main combustion chamber and so ignited the whole of the mixture. Once the engine was started the burning of the gases inside the tube practically kept the tube hot without the use of the external blow lamp.

In order to withstand the heat at which the tubes were worked, they were made of platinum. In those days platinum had very few uses and was comparatively cheap. An engine fitted with such tubes to-day, when platinum is many times the price of gold, would need to be locked in a strong box.

Low-Tension Ignition.

About the same time as the hot tube ignition was used the low-tension electrical system came into use. This system is still found in certain old stationary engines. A low voltage battery was used and a make-and-break was actually placed within the cylinder head. This make-and-break was so arranged that just when the ignition of the gases was required the circuit was opened and the resulting spark caused the gases to be ignited. The make-and-break was driven with a lever from the camshaft in much the same way as the valves are operated. The chief difficulty with this device was that the spindle that operated the make-and-break, together with the insulated connections, had to be kept gas-tight. Also the make-and-break was subjected to the terrific heat of the burning gases, and since it was situated within the cylinder head was not at all accessible for either cleaning or adjustment.

Originally the current for this ignition device was supplied by a battery of cells. These cells were not the same as those found in the modern battery, but were much more elaborate affairs so that the car really carried a small laboratory.

Later a magneto which generated a low-voltage current was developed and this magneto was known as a "low-tension" magneto as distinct from the modern "high-tension" magnetos. These low-tension magnetos were quite large affairs with several large permanent magnets.

Following on the low-tension system high-tension ignition systems were developed.

The essential difference between low-tension and high-tension ignition systems is that in the former the two pieces of metal causing the spark (electrodes) actually touched together and were then drawn apart so that a spark or arc resulted, while in the later such a high voltage is used that a spark will actually jump between two points separated by a sixteenth of an inch or more.

An example of the difference in the voltage required to do these two things is the following:—Every motorist has at some time or other accidentally caused a "short" on the battery of his car and has noticed that quite a violent spark results, as the "short" is removed, although the battery of the car has only six or twelve volts. On the other hand, a voltage in the neighbourhood of 10,000 volts is required to jump across the points of the average spark plug. High-tension ignition systems were first used with a make-and-break and spark coil in much the same manner as the modern coil ignition system. However, in the early days batteries were very

unreliable and generators to keep the battery charged were not available, so that the whole ignition system was unreliable. Thus when the high-tension magneto was developed it became very popular, as it was a self contained unit which generated all the electricity it required within itself.

Just prior to the war magneto ignition was almost universal on good quality cars, and the magneto had reached a high degree of perfection. The Bosch factory of Germany practically dominated the market, as the firm was the first to develop a satisfactory high-tension magneto. This same firm to-day is well to the fore in the development of fuel injectors for high-speed Diesel engines, which bid fair to be the engines of the future.

The necessity for electric light and electric starting on the modern car has caused the electrical generator and battery to be brought to a high standard of reliability, and as a result battery ignition systems using an induction coil to convert the low voltage of the battery to high voltage (high tension) are once more the prevailing favourites, although twenty years ago the magneto had practically eliminated this system.—Radiator in "The Farmer and Settler."

THE FARM TRACTOR.

THE IMPORTANCE OF DECARBONISING

Probably the most common cause of trouble in the internal combustion motor is the formation of carbon on piston, cylinder, or valve heads, and at the end of a strenuous season a half-day may be profitably spent taking down the engine and decarbonising. This formation of carbon occurs in any internal combustion engine and is, more or less, governed by the extent to which the motor is used.

Obviously, the quality of the fuel and oil also plays an important part; but even with fuels and oils of the highest quality, carbon formation inside the motor is inevitable. The removal of this is a simple matter and should be regularly attended to, as carbon causes a variety of different troubles in the engine.

It is easy to see that a heavy formation of carbon on the piston and cylinder head reduces the compression space and correspondingly increases the compression ratio of the engine. If it is the manufacturer's idea that the compression ratio should be, say, 5 to 1, a heavy formation of carbon in the combustion chamber may increase this ratio sufficiently to cause a bad knocking, due to the heightened compression of the engine. This reduces the power of the motor, and the knocking considerably increases the wear on the working parts.

Carbon, too, is often responsible for pre-ignition. Pre-ignition means the igniting of the charge before the piston has reached the top dead centre of its stroke. The result is that the explosion occurs before it should, and the piston is met whilst still on its upward stroke with the force of the explosion causing bad knocking and undue wear.

The removal of carbon from any internal combustion engine is a simple matter, and can easily be accomplished by the tractor owner himself. The following method applies in the big majority of cases:—

First drain the radiator of water and loosen off the water connection between the radiator and the cylinder head. Remove the cylinder head bolts or nuts and carefully lift the head off, taking care not to damage the copper asbestos gasket which is between the head and the cylinder block. If this has become bent or torn in the process, it is wise to replace it with a new gasket, as no amount of straightening out or pressure will stop water from the radiator or explosive gases from seeping through the gasket, the copper lining of which has become creased. All the carbon on the cylinder head should be scraped off and the surface wiped clean with a kerosene rag. When scraping the tops of the pistons, bring each piston to the topmost point in the cylinder so that no carbon will adhere to the oil on the cylinder walls. Clean out the valve heads and ports, and see that no carbon lies between the valve and its seat. This would result in an imperfect seat and bad compression.

When the job is thoroughly clean, paint both sides of the copper asbestos gasket with shellac or gasket cement and replace the cylinder head. In tightening up the bolts, take them all up gradually so that the pressure is evenly distributed over the head. This is in order to avoid warping. Replace the water connection; refill

the radiator; and start the motor up. When it has run sufficiently to become warm, tighten up the cylinder head bolts again, as it will be found that, due to the vibration of the explosions and the expansion due to heat, the bolts can be still further tightened.

Decarbonising is an excellent job for the tractor owner on a rainy half day, and he will be amply repaid for his trouble. Obviously, the amount of carbon formed in an engine is, to a great extent, controlled by the quality of the kerosene and lubricating oil used in it.

Spark Plugs.

If an engine is giving uneven results, or is missing badly, the owner almost invariably attributes the trouble to the plugs and takes them out for inspection. This inspection, however, generally does not go much farther than the points of the plugs which, as a general rule, are not responsible for the trouble. It is not often that the points of the plug become so far contaminated with carbon to completely close up, thereby short circuiting the plug and causing it to become dead.

The most common cause of short circuit in a spark plug is through the electrode becoming covered with carbon, and becoming short circuited by this with the iron jacket of the plug. When you take the plugs out, completely scrape them inside and as far down as can be reached with a pointed scraper, such as a twine needle used for sewing wheat bags; this makes a good tool for the purpose. When the plug has been completely cleaned, pour some petrol inside it and burn it out. The points should be set to an approximate distance of $\frac{1}{32}$ of an inch. It will be found that this spacing gives the best results under all conditions.

A common cause of plug trouble is a cracked porcelain, which is often not easily discernible as the plugs, particularly on tractors, become covered with dust and dirt. The plugs should be regularly inspected every week, and their condition ascertained. We often hear of tractor owners who boast that they have never taken the plugs out of their machine in twelve months. This is extremely bad practice. A plug giving a weak spark causes only partial combustion of the charge; this results in poor power, wasteful running and excessive dilution of the crank case oil by the unburned portions of kerosene which find their way between the piston and cylinder wall into the crankcase. In order to ascertain the type of spark being given by the plugs, take them out, attach them to their connecting wires and lay them on the cylinder head. Switch on the ignition and turn the engine over fairly fast by the crank handle; and observe the sparks jumping between the plug gaps. A thin, blue spark is a weak spark. The ideal colour is red and fat. Obviously, a faulty spark may not always be due to the plug itself—it may be caused by some weakness in the ignition system.

Very often, particularly during harvest when the tractor is working full time and there is no leisure in which to give attention to mechanical details, work has to be gone ahead with an imperfectly operating machine.

Valves.

There is no doubt that the valves, particularly the exhaust valves, of internal combustion engines have to withstand greater heat than any other working part. We are dependent on them for compression and, therefore, operating efficiency; and they consequently demand from us a reasonable amount of care and attention.

In a four-cylinder tractor engine working at, say, 1,200 revolutions per minute, each inlet and exhaust valve is opening and shutting 600 times per minute, or ten times each second. The inlet valve opens to admit ten charges of gas to each cylinder per second; the exhaust valve opens to discharge ten exhausted explosions. When it is realised that the heat in the combustion chamber at the point of explosion is approximately 3,000 deg. Fahr., we begin to wonder how the exhaust valves ever retain the surface and hold the compression. Obviously, extensive use of the motor must, in time, cause the exhaust valve to become burned and pitted, resulting in loss of compression, poor power, and uneconomical running. This can only be corrected, and cannot be obviated.

The term "grinding in the valves" is familiar to all of us, but the actual method of procedure is not so well known; and, in order to assist those who would like to do the work themselves, we give the following method:—

Having removed the cylinder head, the valves should be removed from the cylinder block by releasing the valve cotters and springs. Before removing them from their seats, number each valve by lightly tapping with a punch in order that

you will be certain of putting each valve back in the pocket from which it came. Examine the valve seats in the cylinder block, and if they are badly burned or pitted they should be cleaned up with a refacing tool, which is obtainable at little cost. This is a cutting instrument which is easy to apply and which, if used properly, results in the seat being properly faced and, what is highly important, faced at the correct angle.

Having scraped the valves clean of carbon, place each one in its corresponding guide and commence grinding the seat of the valve to correspond with the seat in the cylinder block. A proper grinding paste is obtainable for this; or a very fine emery mixed with oil can be used. Apply a small portion of this to the valve seat and, using a screw driver, rub the valve into the seat with a semi-rotary motion until the grinding paste reduces the seat of the valve to a fine, even, and polished surface corresponding exactly with the seat in the cylinder block. Having accomplished this with all valves, replace springs and cotters and adjust the valve tappets to allow for clearance between the end of the valve stem and the tappet. This clearance should amount to approximately five or six thousandths of an inch. If this clearance is not allowed, the heat expands the valve and it will ride on the tappet and not on its seat, resulting in poor compression.

Regular attention to the valves is essential for economical running. Good fuel plays an important part in the amount of attention which is required to keep the valves in perfect condition. A slow-burning fuel means that, instead of hot gases being thrust past the exhaust valves, the actual flame itself meets the valve seats, and the result is more extensive and quicker pitting of these surfaces.

THE ROYAL SOCIETY OF QUEENSLAND.

MAY MEETING.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 26th May, at 8 p.m. Included in the attendance were Professor Sir E. T. Edgeworth David, Professor E. W. Skeats, Dr. P. Marshall, Dr. L. K. Ward, Dr. C. Fenner, Mr. J. F. Bailey, and Professor Summers.

Mr. C. T. White exhibited a specimen of the fruit of *Parinarium laurinum* A. Gray, picked up on the beach at the southern end of Moreton Bay by Mr. Densil Curtis. Fruits of this tree, which is a native of the Solomon Island and New Guinea, are sometimes picked up on the Queensland beaches, but the species so far as known has not yet succeeded in establishing itself here.

Dr. E. O. Marks read a paper entitled "The Physiographical Significance and Non-Migration of Divides."

Where, owing to comparative shortness or other denudational advantage, one stream is more active than its neighbour, it will erode its basin more rapidly, and encroach on the neighbouring basin. This shifting of the divide, known as migration or headward erosion, is generally recognised as a very active physiographical principle, and on it is based the theories of river-capture and rearrangement of drainage which figure largely in modern physiography.

In this paper it is pointed out that, according to the theory, any originally straight divide must be made crooked by the irregular action of this headward encroachment. Consequently any straight divide must have a tectonic origin and still be in its original position.

The Blackall-D'Aguilar ranges form such a straight divide, separating the group of numerous short streams running eastwards into the sea from the headwaters of the Stanley and Mary rivers. On Mount Mee and Blackall tablelands the divide is at 1,500 ft. elevation, but for 10 miles between these is about 500 ft. Here the rocks are soft and differential denudation obviously accounts for the lower elevation and different character of this part of the divide. Although the short streams have courses entirely on soft sandstone country, while the Stanley waters have 180 miles to go largely over hard rocks, and although there is clear evidence of the lowering of this part of the divide by denudation at least 1,000 ft., there has been no migration, and this in a situation where it would necessarily have occurred had the theory been correct.

Other straight divides confirm this absence of migration in situations where the theory would require it, except to such a minor degree as to render it utterly incapable of the results claimed for it.

It is necessary, therefore, that all that part of physiographical theory depending on the migration must be seriously modified if not entirely discarded.

Some inquiry is made to discover the flaw which renders the theory inconsistent with the observed results of these nature-performed experiments.

This paper was discussed by Professor Sir Edgeworth David, Drs. Ward, Fenner, Marshall, and Bryan, and Messrs. Bennett and Jones.

Mr. Perkins read extracts from a paper by B. B. Grey, entitled "Chaetognatha from the Society Islands."

The *Chaetognatha* discussed in this paper were collected in sixteen hauls, irregularly spaced over a period of twelve months. Ten species are represented, belonging to two genera, *Sagitta* and *Pterosagitta*, including *S. oceania* n. sp. A table illustrating the coincident occurrence of the species is included. *Sagitta oceania* n. sp. is described as new to science, the description being supplemented by several text figures. The fertilisation of the *Chaetognatha* is discussed, special reference being made to observations on *S. oceania* and *S. enflata*. A brief account is given of the parasites found in four species of *Sagitta*. A meal taken by *S. enflata* is described in detail, the meal being a specimen of *S. fridrici*.

The following paper was laid on the table:—"Essential Oils from the Queensland Flora, Part 2, *Agonis abnormis*," by T. G. H. Jones, D.Sc., and M. White, M.Sc.

Examination of the essential oil obtained from the leaves of *Agonis abnormis* (yield ·6 per cent.) has shown that it possesses the following constants:—$d_{15 \cdot 5}$, ·9040, n_D^{20}, 1·4905, $[\alpha]$ D, + 9, Ester number 7·4 Acetyl value 16, Acid number 1·7, and is composed of a mixture of d α-pinene 30 per cent., aromadendrene 60 per cent., and a small percentage of sesquiterpene alcohols. The aromadendrene fraction is being further examined and at least two sesquiterpenes are present.

JUNE MEETING.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 30th June. The President, Mr. J. B. Henderson, was in the chair. Messrs. F. Barker and J. B. Wadley were unanimously elected members of the Society.

A paper, entitled "The Genus Oxyscelio: Its Synonymy and Species, with the Description of One New Genus," by Mr. A. P. Dodd, was laid on the table.

This paper discusses the characters of the Scelionid genus *Oxyscelio* Kieffer, erected with *O. forcatus* Kieffer from Java as the genotype. The genera *Camptoteleia* Kieffer, *Dicroteleia* Kieffer, and *Xenoteleia* Kieffer are regarded as synonyms of *Oxyscelio*, the reasons for making these alterations being given at length. Many species originally described or formerly placed in the genera *Sceliomorpha* Ashmead, *Hoploteleia* Ashmead, *Psilanteris* Kieffer, and *Scelio* Latreille are transferred to *Oxyscelio*, which will now contain 32 listed species from Ceylon, the Philippine Islands, Java, and Australia.

The characters of *Oxyscelio* are compared with those of related genera. A new genus, *Bracalba*, is erected to contain *Chromoteleia nigrescens* Dodd and two new species, *Bracalba laminata* and *B. cuneata*, all from Australia, *B. laminata* being selected as the genotype.

The main business of the evening was the following series of exhibits:—

Dr. L. Bagster conducted some very interesting experiments with liquid air, and showed a metallic spectrum on the lantern screen.

Mr. E. J. Wood, M.Sc., exhibited specimens of the following diseases of sugar cane from the collection of the Bureau of Sugar Experiment Stations:—(1) Physiological: Chlorosis (deficiency), banded chlorosis (the effect of cold moist nights). (2) Virus: Two specimens showing Mosaic (Fiji) disease, which, though not shown by the experimenter to be transmitted by inoculation or by insects, has X bodies which seem to indicate its virus nature. Dwarfing is a disease which seems to be new to science. It has not been reported from any other country, and 66 stools of is are known. It resembles Fiji disease in its symptoms, except that the galls are replaced by chlorotic areas somewhat similar to Mosaic. It is a phloem disease and is transmissible through sets, as has been proved by the writer, who is at present working on the etiology of the disease. Its symptoms suggest a virus disease, but artificial inoculations have not yet succeeded. (3) Bacterial: Gumming (*Bacterium vascularum*); Leaf Scald (*B. albilineans*); and Top Rot, a bacterial

disease not confined to the vascular tissue. (4) Fungal: Downy Mildew (*Sclerospora sacchari*), Pokkah Boeng, and Knife Cut (presumably *Fusarium moniliforme*). A number of root diseases of fungal origin were exhibited. Peg Leg is a butt infection of the Bundaberg-Childers areas and clayey Mackay soils. *Schizophyllum commune* is a secondary parasite of little importance. (5) Phanærogamic Parasites: *Striga* spp., which are short-lived, flourishing from December to February. (6) Teratological: Hairy Root, a rare abnormality.

Dr. D. A. Herbert exhibited: (1) Haustoria of *Olax retusa*, a phanærogamic parasite attacking *Gahnia* sp.; the haustoria were the size of a pinhead, and were collected at Burleigh, June, 1930. (2) A French bean seed with two embryos. (3) *Phragmidium disciflorum*, a rust of the rose on the variety Star of Queensland (uredospore stage). (4) A section of a stem of a liana, *vitis acetosa*, with exceptionally long and wide vessels.

On behalf of Mr. E. C. Tommerup, B.Sc., specimens were exhibited of Hoop Pine (*Araucaria Cunninghamii*) showing heat girdling, which he has investigated in conjunction with Mr. R. B. Morwood, M.Sc. The stem and crown die, the roots remain vigorous and often throw off coppice leaves at ground level. At the ground level, however, a collar-like construction is formed, and though the bark is unbroken the water supply is evidently cut off and the tree dies. Plantation trees of two or three years' establishment may be affected. The girdle is often associated with slight swellings above and below the constriction; when the bark is peeled away, dark necrotic rings may be seen above and below the lesion. This disease has been reported from Reserve 151, Neumgna, in the Bunya Mountains area, and from Reserve 220, Kilkivan. Both these areas are on the ecological limit of the rain forests and only receive about 35 inches of rain per annum, with a mean summer temperature of approximately 80 deg. F. Although Bunya Mountains area is one in which the pines are frequently affected by fungal growths, it is considered that this condition exists because the trees are struggling for a living and are more susceptible to fungal attack than are vigorous trees, rather than that the meteorological conditions of this locality are favourable to fungal incubation. The plants attacked are nearly always in exposed situations on heavy soil. Several possible factors were considered, such as wind, damping, fungus, insect injury, frost, &c., but it was eventually decided that it was primarily due to the heating effect of the soil when exposed directly to the sun's rays. Similar diseases are recorded from U.S.A. with other conifers.

Dr. J. V. Duhig, on behalf of Professor Goddard and himself, showed two fish of the species *Galaxias o'connori* (Ogilvy) which had suffered from melanosis. Dr. Duhig showed lantern slides of sections of the skin of the fish. The pigmentation was shown to be due to heavy deposits of what is believed to be melanin about the walls of rounded or oval sub-epithelial cysts, which are lined with epithelium and are, in reality, processes budded off from the skin epithelium. Another section showed these cysts to contain a parasite, which Dr. Goddard stated to be the metacercaria stage of a trematode, *Clonorchis* (? species). A section was shown demonstrating the ventral sucker by which the genus could be identified. The fish is the second intermediate host of the parasite and the authors propose to continue their investigations in the direction of feeding experiments in order to secure the adult worm. To this end they desire specimens of sick fish which are well pigmented. The exhibit had a double interest, in that it raised the problem of melanin production and the subject of the exhibit was an indigenous species to which little attention had been paid.

Mr. C. T. White exhibited specimens of *Datura ferox* Linn. from Clermont, Central Queensland. The species, which is supposed to be a native of Spain and Sicily, was first collected in Queensland at Macalister, Western Darling Downs, by E. W. Bick about March, 1916. Since then it has spread to other places, but Clermont represents the northernmost locality so far recorded.

Professor H. C. Richards, D.Sc., exhibited several beautiful specimens collected by Mr. A. N. Falk of the zeolite Natrolite, from vughs within the weathered olivine basalt on the Main Range some 2 to 3 miles south-east of Toowoomba. He offered remarks upon the origin of the mineral, its crystalline habit, and how it may be distinguished from other zeolites.

Mr. E. W. Bick exhibited a specimen of flowers of *Spathodea campanulata*, the tulip-tree of West Africa. The unopened flower-buds of this species contain a considerable quantity of water of glandular origin. The plant is sometimes known as the fountain-tree on account of the behaviour of the buds when punctured.

Mr. J. E. Young exhibited matted fibrous roots of *Casuarina suberosa*, which had grown in a blanket-like mass in the crevices of consolidated sand on Stradbroke Island.

ABSTRACTS AND REVIEWS.

Fungous Diseases of Plants.

Jacob Ericksson 2nd ed., Bailliere, Tindall and Cox, London, 1930, 35s. A recent addition to the library Ericksson: Fungous Diseases of Plants.

This book covers a very comprehensive field describing clearly all the more important European plant diseases and giving in most cases the recognised control measures. A short bibliography is appended to the disease under discussion. Briefer reference is also made to the symptoms and etiology of the less common diseases.

Elementary Practical Agricultural Chemistry.

E. M. Joiner, B.Sc., Senior Science Master, Dookie Agricultural College, Victoria, Robertson and Mullens, Ltd., Melbourne, 6s.

A useful little book suited to any student of agriculture who seeks a knowledge of simple analytical operations for the testing of products used in agriculture, both qualitatively and quantitatively.

Live Stock of the Farm. (6 Vols.)

Edited by Professor C. Bryner Jones, M.Sc., F.H.A.S., Agricultural Commissioner for Wales under the Board of Agriculture and Fisheries (Great Britain), and Chairman of the Welsh Agricultural Council. Gresham Publishing Company, Limited, London. Queensland Book Depôt, £2 set.

The subject of this work is of great importance to Australia. The value of stock breeding has never been so widely recognised as at the present time, nor has it in its many aspects received closer or more general attention. Schemes for stock improvement, and the means for the investigation of scientific problems connected with animal husbandry are comparatively new movements in this country, which will certainly be attended in time with far-reaching results. Already they have invested the work of stock breeding with an interest and a significance in our national outlook.

Every part and aspect of the subject is dealt with, as far as possible, in a manner consistent with the object in view in these fine and well printed and illustrated volumes. They include the work of many writers, each a specialist in his subject, whose name is well known to breeders in every stock-raising country. The whole work is a comprehensive, complete, and practical treatise on Live Stock on the Farm. The editor, contributors, and publisher alike have obviously spared no effort to make it, whether in its general conception, its arrangement, or the character of its contents, a really useful book of reference to the farmer and stock breeder.

Each volume of the set of six is replete with many plates depicting typical specimens of the breeds of livestock with which it deals. Volume I. covers the Principles of Breeding; Breeds of British Cattle; the Improvement of Cattle; and the Selection and Judging of Cattle. The contents of the other volumes include:—Volume II.—The General Management of Cattle. The Feeding of Cattle. The General Principles of Animal Nutrition. Diseases of Cattle. Volume III.—Breeds of Horses. The General Managament and Feeding of Heavy Horses. The Management of Light Horses. Common Diseases of the Horse. Volume IV.—Sheep Farming. Breeds of Sheep. General Management and Feeding of Sheep. Diseases of Sheep. Volume V.—Breeds of British Pigs. The Management and Feeding of Pigs. Bacon Curing. Diseases of Pigs. Breeds of Poultry. The Management and Feeding of Poultry. Profitable Poultry Farming. Diseases of Poultry. Volume VI.—Bees and their Management. Goats and their Management. Dogs and their Management. Ferrets and their Management. Asses and Mules.

A comprehensive index completes a very useful work that should find a place on every farmer's book shelf.

Our copy is from the Queensland Book Depôt, Epworth House, 232-4 Albert street, Brisbane.

Through the advantage of a special purchase the management of the Queensland Book Depôt is able to offer the complete set for £2, a charge very much below the publishing price.

The Young Farmer.

NOTES ON CALF FEEDING.

Contributed by C. F. McGRATH, Supervisor of Dairying.

No fixed rules can be laid down for the feeding of calves, because the feeding depends not only upon the age of the calf, but also upon its size, health, and vigour. Therefore the quantities of feed mentioned in the following table are to be taken as guides only—to be decreased or increased according to the experience gained from the feeding of any individual calf.

The young calf has a small stomach, and the calf when running with its mother takes milk frequently and in small quantities. Therefore, in hand feeding, the greatest care must be taken not to over feed with milk of any description. Too large an allowance of milk produces indigestion and scour.

When a young calf has been without feed for some hours and is then allowed to take as much milk as it will, it is apt to gorge itself, thus causing digestive troubles.

Milk.

A calf, weighing somewhere about 50 lb. at birth, for the first few days should be given from 5 to 8 lb. per day of its mother's milk, divided amongst four feedings. Somewhat more is given to a calf weighing about 100 lb. at birth—viz., 8 to 10 lb. per day of the mother's milk distributed over four feedings.

All milk fed should be at blood heat—viz., from 95 deg. to 100 deg. Fahr.

If the calf is healthy and strong, at about ten days old the whole milk may be gradually replaced with separated milk.

Grain.

When from two to three weeks old the calf can be taught to eat ground grains or concentrates, by placing a little of the ground grain or concentrate at the bottom of the tin from which the calf has just finished drinking its milk.

Ground grains include such material as maize meal, bran and pollard, ground oats, Kaffir corn meal, barley meal, &c. Better results are obtained by feeding a mixture of grain, than by feeding one grain alone.

Concentrates.

Concentrates include linseed, cocoanut and peanut cake and meals, and calf foods.

When the concentrate is entirely linseed meal it must be first mixed to a smooth paste with a little water, then more water added and the mixture boiled from ten to twenty minutes, before being fed to young calves.

Feeding Tables.

As before stated, the following tables are to be used as guides only. The time when feeding milk should stop depends upon a number of conditions—viz., whether the calf is strong and healthy, and if food other than milk, such as good hay and grain and young pasture is available.

As a rule, not more than 18 to 20 lb. of milk per day are fed to calves.

The amount of lucerne hay given to young calves should not be excessive, as such excess is liable to cause scour.

Any uneaten lucerne, oaten or wheaten hay or chaff, ground grain, or concentrate, should be removed and feeding vessels cleaned, and fresh material given for the next feed.

Additional Mineral Requirements.

A mixture of 1 part by weight of salt with 2 parts by weight of finely sterilised bonemeal or 2 parts of finely ground Nauru phosphate should be dusted over the ground grain or concentrate ration.

Substitute for Separated Milk.

If separated milk is not available, dried skim milk powder, or dried butter milk may be used by taking 1 lb. of either of these materials and mixing with 9 lb. of water, and using such mixture in the same way as separated milk is used in Table No. 1 or Table No. 2.

TABLE No. 1.—FEEDING COD-LIVER OIL AND GROUND GRAINS IN ADDITION TO MILK, HAY, AND PASTURE.

(Compiled by E. H. Gurney, Senior Analyst.)

Age.	Feeding Period per day.	Whole Milk per day.	Separated Milk per day.	Clean Water.	Cod-liver Oil per day.	Ground Grains per day.	Hay.	Pasture.
		Lb.	Lb.					
1 week..	3 times	8·0	..	..	..	..	..	..
10 days..	Twice	8·5	0·5	..	..	..	..	..
11 days..	ditto	8·0	1·5	..	..	..	..	..
12 days..	ditto	7·5	2·5	..	..	..	..	..
13 days..	ditto	7·0	3·5	..	..	..	..	..
14 days..	ditto	6·0	4·5	Access to	2 teaspoonsful	A little	A little	..
15 days..	ditto	5·0	5·5	ditto ..	ditto ..	ditto	ditto	..
16 days..	ditto	4·0	6·5	ditto ..	4 teaspoonsful	ditto	ditto	..
17 days..	ditto	3·0	7·5	ditto ..	ditto ..	ditto	ditto	..
18 days..	ditto	2·0	8·5	ditto	2 tablespoonsful	ditto	ditto	..
19 days..	ditto	1·0	9·5	ditto ..	ditto ..	ditto	ditto	..
20 days..	ditto	0·5	10·5	ditto ..	ditto ..	ditto	ditto	..
21 days..	ditto	..	12·0	ditto ..	3 tablespoonsful	5 to 6 oz.	*Ad lib.*	On pasture
22 days..	ditto	..	13·0	ditto ..	ditto ..	ditto	ditto	ditto
23 days..	ditto	..	14·0	ditto ..	ditto ..	ditto	ditto	ditto
24 days..	ditto	..	15·0	ditto ..	ditto ..	ditto	ditto	ditto
25 days..	ditto	..	15·0	ditto ..	ditto ..	ditto	ditto	ditto
26 days..	ditto	..	16·0	ditto ..	ditto ..	ditto	ditto	ditto
27 days..	ditto	..	17·0	ditto ..	ditto ..	ditto	ditto	ditto
28 days..	ditto	..	18·0	ditto ..	ditto ..	ditto	ditto	ditto
5 weeks	ditto	..	20·0	ditto ..	ditto ..	ditto	ditto	ditto
6 weeks	ditto	..	20·0	ditto ..	ditto ..	8 oz.	ditto	ditto
2 months	ditto	..	20·0	ditto ..	..	1 lb.	ditto	ditto
3 months	ditto	..	20·0	ditto ..	..	1½ to 2 lb.	ditto	ditto
6 months	ditto	..	20·0	ditto ..	..	2 lb.	ditto	ditto

TABLE No. 2 FEEDING CONCENTRATES IN ADDITION TO MILK, HAY, AND PASTURE.

Age.	Feeding Period per day.	Whole Milk per day.	Separated Milk per day.	Clean Water.	Concentrate per day.	Hay.	Pasture.
		Lb.	Lb.				
1 week..	3 times	8·0	..	..	..	..	..
10 days ..	Twice	8·5	0·5	..	..	..	..
11 days ..	ditto	8·0	1·5	..	..	..	..
12 days ..	ditto	7·5	2·5	..	..	..	..
13 days ..	ditto	7·0	3·5	..	..	..	..
14 days ..	ditto	6·0	4·5	Access to	A little ..	A little ..	..
15 days ..	ditto	5·0	5·5	ditto ..	ditto ..	ditto ..	..
16 days ..	ditto	4·0	6·5	ditto ..	ditto ..	ditto ..	..
17 days ..	ditto	3·0	7·5	ditto ..	ditto ..	ditto ..	..
18 days ..	ditto	2·0	8·5	ditto ..	ditto ..	ditto ..	..
19 days ..	ditto	1·0	9·5	ditto ..	ditto ..	ditto ..	.
20 days ..	ditto	0·5	10·5	ditto ..	ditto ..	ditto ..	..
21 days ..	ditto	..	12·0	ditto ..	5 to 6 oz. ..	*Ad lib.* ..	On pasture
22 days ..	ditto	..	13·0	ditto ..	ditto ..	ditto ..	ditto
23 days ..	ditto	..	14·0	ditto ..	ditto ..	ditto ..	ditto
24 days ..	ditto.	..	15·0	ditto ..	ditto ..	ditto ..	ditto
25 days ..	ditto	..	15·0	ditto ..	ditto ..	ditto ..	ditto
26 days ..	ditto	..	16·0	ditto ..	ditto ..	ditto ..	ditto
27 days ..	ditto	..	17·0	ditto ..	ditto ..	ditto ..	ditto
28 days ..	ditto	..	18·0	ditto ..	ditto ..	ditto ..	ditto
5 weeks	ditto	..	20·0	ditto ..	ditto ..	ditto ..	ditto
6 weeks	ditto	..	20·0	ditto ..	8 oz. ..	ditto ..	ditto
2 months	ditto	..	..	ditto ..	1 lb. ..	ditto ..	ditto
3 months	ditto	..	..	ditto ..	1½ to 2 lb.	ditto ..	ditto
6 months	ditto	..	..	ditto ..	2 lb. ..	ditto ..	ditto

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

"Thorn Apple."

L.D.C. (Emerald)—

The specimen is *Datura ferox*, a species of thorn apple, an ill-smelling, coarse annual weed that first made its appearance on the Western Darling Downs about 1916. Since then it has spread, though rather slowly, to other parts of the State. The whole plant, like others of the genus is poisonous. We cannot say how the plant came here, and there is some doubt about its native country. It is generally regarded, however, as native to Spain and Sicily. Attention was drawn to the plant by means of an article and illustration which appeared in the "Queensland Agricultural Journal" for July, 1917.

Mission, Sour, or Yellow Grass.

A.H.K. (Woombye)—

Your specimen is *Paspalum conjugatum*, the Mission Grass, or more commonly known in Queensland as Sour Grass or Yellow Grass. On the Atherton Tableland, where this grass is very abundant, it is looked upon as very poor fodder for dairy cattle, and also tends to overrun a pasture to the exclusion of better grasses such as ordinary Paspalum and Rhodes. Cows are said to milk very poorly on it. The grass is very common throughout the Pacific, and we have seen working mules in New Guinea do quite well on it in the absence of other fodder. Nevertheless, the experience of practical dairy farmers in Queensland is that the grass is practically useless from a dairying standpoint. Seed is not stocked by the nurserymen.

Wood-Sorrel.

V.J.B. (Miles)—

Your specimen is not a clover, but *Oxalis corniculata*, a species of wood-sorrel. It has no particular value as a fodder.

Grass (*Neurachne*) Identified.

N.A.R.P. (Townsville)—

Your specimen of grass is an undescribed species of *Neurachne*. I collected some of the grass myself some years ago at Barcaldine. It will be named and described when Mr. Hubbard is publishing his account of the Queensland grasses. The genus is only a small one but contains some quite good fodders, one of the best known of which is *Neurachne Mitchelliana*, the so-called Mulga Mitchell moderately abundant in parts of South-western Queensland and Northern New South Wales.

Black Mauritius Bean.

F.A.G. (Townsville)—

The name of the bean from Innisfail is *Stezolobium aterrimum*, popularly known in Queensland as the Black Mauritius Bean, fairly extensively grown throughout the tropics as a green manure, especially for cane fields. The plant has long been known in cultivation, but its exact native country is not known. The beans, so far as we know, have no value at all as food for stock. The bean is sometimes confused with the Florida Velvet Bean, but this is really a different plant.

Alton Downs Blue Grass (*Andropogon nodosus*).

G.B.B. (Rockhampton)—

Your specimen of grass has been determined by Mr. Hubbard, of the Kew staff, who is now in Brisbane working on Queensland grasses, as *Andropogon nodosus*, a native of India. In the nomenclature now adopted the name of the grass would be *Dichanthium nodosum*, the genus *Andropogon* as understood by older authors having been divided up into a large number of

smaller ones. The species was originally described from specimens collected in Mauritius. It has also been found in India, Bourbon, Rhodesia, New Caledonia, and the West Indies. It is probably a native of India and has been introduced elsewhere. Lisboa (List of Bombay Grasses) states that it is used as a fodder in the Bombay district. Specimens were first sent to the Herbarium in May, 1917, from Alton Downs by Mr. Brooks. Later (March, 1926) it was received from Mr. A. H. W. Cunningham, of Strathmere, Bowen. Mr. Quodling forwarded specimens last April which he had collected from the grass plots at Archer. He gave the common name as "Alton Downs Blue Grass." The specimen was then named *Andropogon annulatus*. The latter is a distinct Indian and African species, and has not been found in Queensland. This grass has been usually placed as a variety of *Andropogon caricosus* L. It differs from that species in its more robust habit, longer awns, and in the peduncles of the racemes and the apex of the culms being densely pubescent.

Needle Burr.

R. S. (Bundaberg)—

Your specimen is *Amarantus spinosus*, a native of tropical Asia, a common annual weed in most tropical and sub-tropical countries, including Queensland. It is most popularly known in Queensland as needle burr, and is most abundant on the Atherton Tableland. It is not poisonous in any way, as a matter of fact is recorded as being used as spinach by the Asiatics in times of scarcity of food. A number of weeds allied to it, common in India and Australia, are used in the same way.

Grasses—*Chloris barabata*, a Native Panicum. *Crotalaria striata*.

J.H. (Cairns)—

The grass with the purplish seed-heads is *Chloris barabata*, a species allied to the Rhodes grass and very common in Central and North Queensland. Some years ago it was boomed somewhat as a fodder, but later experiences did not seem to bear this out. The smaller grass is *Panicum distachyum*, a native Panic grass, rather valuable both for forage and hay purposes. The weed is *Crotalaria striata*, a plant poisonous to stock, though apparently not often eaten by them. A pamphlet reprinted from the "Queensland Agricultural Journal" has been posted for your information.

Stagger Weed. Mallow.

C.F.W. (Kingaroy)—

Of your two specimens, one in flower is the Stagger Weed, *Stachys arvensis*, a very common weed in cultivation paddocks in Queensland and proved by feeding experiments to cause "staggers" in working stock. Resting stock such as dairy cows do not seem to become affected by it. It is also commonly known as Wild Mint or Mint Weed, though this name is applied to a number of allied plants in addition. The other specimen bore neither flower nor seed, but we should say it represents a seedling growth of the common Mallow, *Malva parviflora*, which has been proved to cause "shivers" or "staggers" in stock also, as proved by feeding experiments in New South Wales, but we have never heard of any trouble being caused by the plant in Queensland. We think it is only when the plant is in very great abundance and of a very tall vigorous growth that any trouble is experienced.

Polypore (fungus).

D.A.W. (Fraser Island)—

The specimen represents the underground or mycelial stage of a species of Polypore. The Polypores are fungi found both growing in the ground and on trees and dead wood. Their chief characteristic is that the spore-bearing surface is covered with a number of minute pores or pits. These underground tubers are occasionally dug up in Australia and are generally regarded as representing one species, *Polyporus Mylittae*, but that cannot be proved of course, as fruiting buds are so rarely produced. The fruiting bud comes up in the form of mushroom-like plants above the surface of the ground. They have been known to send out these fruiting buds when put away in museum cases. The tubers are supposed to have been eaten by the natives in the early days, hence the name, sometimes applied, of Blackfellow's Bread.

Poison Peach. ***Cassia.***

M.K. (Mt. Fox, Ingham)—

If you wish to learn the names of the various weeds and undergrowth on your property and the report on their properties, we would advise you to send specimens for identification. The specimens should consist of a shoot a few inches long and bearing either flowers or seeds; they should be dried flat between sheets of newspaper for a few days before sending. They should also be numbered, a duplicate being kept similarly numbered for checking for identification when the report on them is received.

The plant you describe as Wild Peach or Poison Peach is *Trema aspera*, generally regarded as very poisonous, though we have at times seen stock eat freely of the plant without ill-effects following. The trouble is the formation in the leaves of a prussic-acid-yielding glucoside which only occurs now and again, and what controls its presence and absence is not known. The plant you describe as Arsenic Bush is, we should say, a species of *Cassia*. This plant generally causes severe purging in stock if eaten in quantity, but on the whole no ill-effects follow.

Grasses, North Queensland Coastal Country.

INQUIRER (Innisfail)—

Rice Grass (*Spartina Townsendii*) is quite unsuitable for your locality. It is essentially a cold country plant and we are practically certain that the climate, even as far south as Brisbane, is too hot for it. Probably for your purpose the best grass is *Panicum muticum*, common everywhere in North Queensland and generally regarded as a valuable grass for binding river banks. It has the advantage of being a very rapid grower. Another grass that could be tried is the common Buffalo Grass (*Stenotaphrum americanum*). Where land is muddy and subject to covering by the tide you could try the Common Reed (*Phragmites communis*). This species grows quite well in moderately salt water and is fairly common in parts of North Queensland. We do not remember seeing it on the Johnstone, but it is almost sure to be there, as it is fairly common about Cairns. You mention small bamboos. These are worth trying, but for rapidity of growth probably the Spanish Reed, some times called the Small Bamboo in Queensland (*Arundo donax*) would be worth planting. You do not state whether soil is muddy or sandy, but we think it would be advisable to make at least trial plots of all these grasses.

Bird's-foot Trefoil.

INQUIRER (Sydney, N.S.W.)—

Bird's-foot Trefoil (*Lotus australis*) is more a constituent of Southern pastures than it is in Queensland, though it does grow here practically everywhere, though not usually in very large quantities. It has been proved poisonous, the poisonous property being a prussic acid yielding glucoside, such as is present in young Sorghum and some other plants. It is poisonous to stock, especially if eaten in quantities and on an empty stomach. We cannot say the exact amount necessary to kill a beast, but in any case this would vary very considerably with the condition of the animal. Possibly quiet browsing stock would be unaffected by it, as they so often are by these prussic acid producing plants.

Measurement of Log Timber.

J.H.P. (Buderim)—

To find the superficial feet of timber in a tree, take one-quarter of the circumference or girth in inches, multiply by itself, then multiply by the length of the log in feet, and divide by 12; or, if the girth does not divide by four evenly, multiply the full girth in inches by itself, and by the length in feet, and divide by 192. That is the general rule in use by Queensland timber men. A log 50 inches in girth and 20 feet long would yield by this method of calculation 260 superficial feet.

Seed Maize for Sale

All previous lists are cancelled

To growers desirous of obtaining a pure and reliable strain of improved seed, the following varieties are being offered and represent limited stocks raised from selected strains of Departmental seed:—

Yellow.—Funk's 90-Day; Star Leaming; Improved Yellow Dent; Golden Beauty.

Conditions of Sale

Applications for seed, with accompanying remittance (exchange added), should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane. Postal address and name of Railway Station should be given, also date seed should be sent from Brisbane.

Advice will be sent when seed is despatched.

Purchasers are requested to write promptly after receipt of seed, should any matters require adjustment.

Should the variety asked for be out of stock, the Department may substitute another variety unless the applicant indicates a desire to the contrary.

Supplies of these stocks are limited, therefore applicants are advised to name a number of varieties in order of preference. Applicants will not be supplied with more than three bushels or with less than half a bushel of any one variety.

Prices

To enable applicants living at a distance to benefit, a flat rate of 10s. per bushel is being charged. This price includes all railage to the nearest railway station, but where steamer freight is necessary, this and any charges in relation thereto must be paid by the purchaser, and the cost thereof added to the remittance.

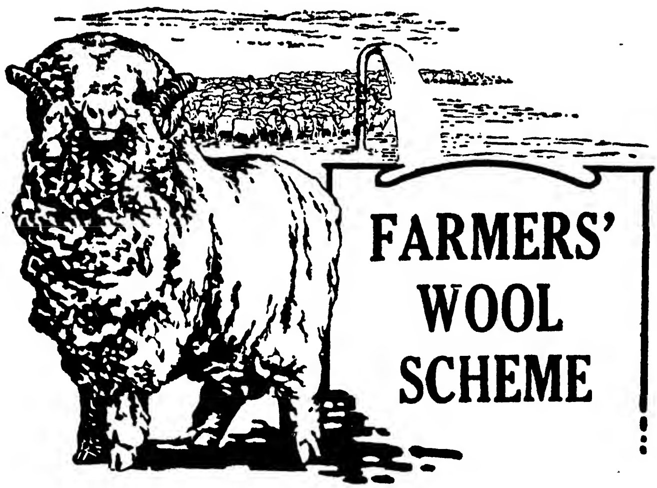
Description of Varieties

Funk's 90-Day.—Since the introduction of this variety to Queensland some years ago by the Department of Agriculture, a considerable amount of time has been devoted each year towards reducing the growing period and improving the type and yield. This is now a very popular variety, and is proving a good yielder, as well as being a good fodder corn. Yields of over 80 bushels per acre have been attained. At present it takes slightly over 100 days to mature. The ears are cylindrical in shape, and usually have sixteen to eighteen rows of very tightly packed grain. The grain is plump, of good depth, and slightly pointed; it has an amber-coloured base, with a rich yellow cap and a crease dent.

Star Leaming.—This is a fairly short-growing, medium-early variety, taking about four months to mature. Ears carry from sixteen to twenty rows of grain, are borne fairly low on the stem, and are weighty and very compact. The grain is of medium size and blunt-wedge shape; bright amber in colour, with a distinct yellow cap and a rough crease dent. It is one of the best of the early varieties; is very suitable for early or catch crops, a heavy yielder, and a very popular variety.

Improved Yellow Dent.—A tall-growing, late-maturing variety—five to five and a-half months. The ears are cylindrical in shape, carrying sixteen to eighteen tightly packed rows. The grain is deep, wedge-shaped, of rich amber colour, with a yellow tip cap and rough crease dent. It is suitable for coastal districts and scrub lands, where there is a good rainfall. It is capable of giving heavy yields of grain and fodder. Special strains of this seed have yielded over 100 bushels per acre under field conditions.

Golden Beauty.—This is a tall-growing, medium-late variety—four and a-half to five months. The ears are long, with very small core, and usually twelve rows of grain. The husk covering is good. The grain is flat, of medium depth, with slightly rounded shoulders; bright amber in colour, with cream-coloured cap and long crease dent. It has a very high shelling percentage, is a very hardy variety, and a splendid yielder. It is also a good fodder corn.



DEPARTMENT OF AGRICULTURE AND STOCK, WILLIAM STREET, BRISBANE.

1. The Minister for Agriculture and Stock is prepared to assist farmers to obtain the best prices for the wool from holdings of less than 1,500 sheep, by receiving such wool, classifying it, and placing it on the market in bulk lines, thereby avoiding sale under Star Lot conditions.

2. A correct account of the wool is kept, and each farmer receives the amount realised less the necessary broker's charges, and other charges which are as follows:—

3.—

(1) A charge of 10s per bale for classification (this charge includes insurance in sheds, on rails, transit, and to selling broker's stores).

(2) All freight, handling, dumping, and rebaling.

(3) Other out of pocket expenses.

4. The Department of Agriculture and Stock charges no commission; an advance of 60 per cent. is made, free of interest, on the estimated value of the wool as at the time of receipt of the wool in the Department's store.

5. The wool will be sold as soon as possible following a sufficient accumulation to enable it to be sold to best advantage.

6. It must be understood that the limit of this arrangement is 1,500 sheep, and that the Department will not accept a clip from a greater number, and is prepared to take classes that do not reach five bales in quantity.

7. The weights as taken in the Departmental Store, and the classification before sale, are to be accepted as final.

8. Farmers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, of their intention, before consigning the wool, advice of which, with all particulars, brands, weights, &c., should be given.

9. CONSIGN THE WOOL TO THE UNDER SECRETARY, DEPARTMENT OF AGRICULTURE AND STOCK, ROMA STREET, BRISBANE.

Recommendations.

(*a*) The bales should be branded on the cap only, so that the packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(*b*) Locks and belly wool should be kept in separate packages.

(*c*) Remove all dags and wet stains before rolling the fleece; the wool requires no other treatment on the farm.

(*d*) All merino wool should be kept separate from other grades and breeds.

General Notes.

Staff Changes and Appointments.

Mr. J. J. Purcell, Temporary Stock Assistant, has been exempted from the operations of Section 18 (3) (c) of the Public Service Acts, and his services have been continued for the period from the 1st July, 1930, to the 31st December, 1930.

Messrs. C. A. M. Reid and C. J. Loseby, of Indooroopilly, have been appointed Honorary Rangers under and for the purposes of the Animals and Birds Acts for the newly created Sanctuary at "Lone Pine."

Mr. C. Dorrell (Yanko Station, via Thargomindah), Mr. E. G. Conrick (Nappamerrie Station, via Nocundra), and Mr. M. A. Seagar (Daymar, via Thallon), have been appointed Honorary Inspectors of Stock as from the 19th July. Mr. W. C. Mylrea, of Leura Station, via Marlborough, has been appointed an Honorary Ranger under the Animals and Birds Acts. The services of Messrs. F. C. Shaw and P. J. Short, Temporary Inspectors of Slaughterhouses at Cairns and Warwick respectively, have been continued from the 1st July to the 31st August.

Mr. K. V. Henderson, Field Assistant, Callide Cotton Research Station, Biloela, has been transferred to Waratah, in the Upper Burnett District.

Mr. H. Flanagan, Inspector of Slaughter-houses, Bundaberg, has been appointed also an Inspector of Brands.

The Brisbane Show.

The House of Pike Brothers, Queen street, extends to country visitors for the Show a cordial invitation to call and make themselves known. Many different departments at Pike Brothers cater completely for the man out of town and many visitors make it a regular practice to stroll through the store and note the many items of apparel that are introduced for their especial benefit from time to time.

Sanctuary for Animals and Birds—Brisbane Catchment Area.

An Order in Council has been issued under the Animals and Birds Acts declaring the Brisbane Water Catchment Area, Mount Coot-tha Reserve, and adjoining lands to be a Sanctuary under the Animals and Birds Acts.

Most of this land has been declared sanctuaries at various times since 1885, and the new Order in Council consolidates the blocks into one sanctuary, with the addition thereto of certain other blocks. Roughly, the sanctuary now takes in the whole of the parish of Kholo, and portions of the parishes of Chuwar, Sahl, Samford, Enoggera, Indooroopilly, and Moggill.

Maps of the sanctuary are being prepared, and these will be displayed at suitable places on the lands concerned.

Tomato Packing—A Handy Wall Chart.

A very useful wall chart, compiled by the Instructor in Fruit Packing, Mr. Jas. H. Gregory, is now on issue to tomato growers at the Head Office of the Department of Agriculture and Stock. As most growers know, correct height and compactness of fruit are essential in the successful carriage and marketing of fruit. In this chart, Mr. Gregory shows, by well reproduced photographs and diagrams, the right way to pack fruit in a simple and graphic way. Every tomato-grower should find a place for it on the wall of his packing shed for ready reference. Application for a copy should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Sectional Group Committee Elections.

On the 8th August, 1929, Regulations 73 to 77 under the Fruit Marketing Organisation Acts, setting out the electorates for the annual elections of the Banana, Pineapple, Citrus, Deciduous, and Other Fruits Sectional Group Committees, were approved. For the elections this year, in the cases of the Pineapple, Citrus, and Other Fruits, the electorate boundaries are slightly different. Accordingly Regulations have been issued rescinding Regulations 74, 75, and 77 made last year, and substituting new ones. These new regulations set out the electorates which will be recognised in the forthcoming elections of the Pineapple, Citrus, and Other Fruits Sectional Group Committees. The electorates recognised in 1929 for the Banana and Deciduous Committees will be again recognised this year.

Sanctuaries for Animals and Birds.

The following places have been proclaimed Sanctuaries under and for the purposes of the Animals and Birds Acts, in which it will be unlawful to kill or capture any Native Bird or Animal:—

(1) The property of Mr. C. A. M. Reid, at Indooroopilly, known as "Lone Pine," a tourist resort, comprising an area of about 32 acres, consisting of portions 130, 138, and 139, parish of Indooroopilly, county of Stanley;

(2) Reserve for Abattoirs, Wolston, R. 1230, parish of Woogaroo, county of Stanley, comprising an area of about 223 acres 2 roods;

(3) Part of the property of Mr. St. J. Robinson, known as "Mount St. John," on the Ingham road, near Townsville, comprising an area of 426 acres, consisting of resubdivision 2 of subdivision 2 of portion 77, parish of Coonanbelah, county of Elphinstone.

Subsidy to Agricultural Societies.

Up to the present, under the Regulations governing the payment of subsidy to Agricultural and Horticultural Societies, no subsidy has been payable to any society, other than those in existence before the 1st July, 1890, which has been or shall be established within a radius of twenty miles of any place in which there is a society in existence. A Regulation has now been passed rescinding the relevant Regulation, so that in future subsidy may be payable to any society established within a radius of twenty miles of any place where a society has already been established.

Baby Beef.

"The baby beef craze is said to have hit the Pacific Coast," a Chicago live stock market paper remarks editorially in a recent issue. There was a time, quite a few years ago, when the demand for baby beef might have been, with some show of justification, denominated as a "craze." The fact is that the trend towards baby beef in recent years has been about the clearest manifestation of sanity in relation to food buying that has been made by any class of consumers. It has been in line with changing living and housing conditions. It made the housewife's money go farther in the purchase of foods, and kept beef on the menu of many a home. It has rebounded to the benefit of the producer of beef cattle, making possible a quicker turnover and eliminating much of the hazard of beef making. If baby beef making is a "craze," it is to be hoped that other lapses from sanity equally as beneficial to the cattle industry and the beef consumers will occur at frequent intervals, says the editor of "The Hereford Journal" in U.S.A.

State Wheat Pool Election Regulations.

Regulations under "*The Wheat Pool Acts*, 1920 *to* 1928," have been issued rescinding the old State Wheat Pool Election Regulations made in 1926, and substituting new ones therefor. The new Regulations differ from the old ones in the following particulars:—

(*a*) The Minister may now appoint a returning officer to conduct elections, whereas previously the Under Secretary conducted any election.

(*b*) The growers' representatives will be appointed for a period of two years, the first of such periods to commence on the 1st September, 1930; the present Board holds office for one year only.

(*c*) Each representative must now be a bona fide wheatgrower; under the old system, any person is entitled to election as growers' representative on the Board.

(*d*) The Minister may publish the notice calling for nominations, the nominations received, and the result of the elections, in such newspapers as he thinks fit, but in at least one paper circulating in each district; in the revoked Regulations certain papers are specified for each district in which such notices must be published.

(*e*) The voting at all elections will be preferential; under the old system preferential voting is optional.

(*f*) Questions arising in connection with any election shall be decided by the returning officer, not by the Under Secretary as has, until the present, been the case.

(*g*) The Minister has now the power to declare any election invalid, and order another; under the old system he had no such power.

Finance for Barley Board.

An Order in Council has been issued to provide for finance for the Barley Board. This Order sets out the conditions under which the Board may borrow moneys to enable it to carry on its operations, and the manner in which securities may be granted. The conditions are the same as those applied to other Commodity Boards.

The Queensland Canary Seed Board—The Season's Returns.

The Queensland Canary Seed Board completed all operations in relation to 1929-30 crop by 30th June. Board accounts were closed expeditiously, and pool costs were moderate, thus enabling a payment to growers of £28 15s. a ton net, that cannot be other than satisfactory. There came to the pool 280 tons 2 cwt. 3 qr. 14 lb.; the cleanings and gradings totalled 29 tons 2 cwt. 2 qr. 16 lb.; this includes wastage from two especially dirty lots. From one of these lots there was 55 cwt. of wastage through mildew, convulvulus, black oats, and an unknown seed which was most difficult to eliminate. This consignment was put through the cleaning machines several times before it was marketable. Another consignment opened up badly, and a very big parcel of gradings was sent back to the consignor.

The character and quality of the seed is such as to encourage its extensive cultivation, and if given a continuance of the of the well-warranted embargo it will be found a profitable crop to grow. It is doubtful if any other crop yields as good a net cash return. The greatest charge against the 1929-30 crop was the wastage, also the attendant cost of cleaning and grading. In many cases repeated cleaning was necessary, as the Board was determined to market a seed that would in every way compare with Moroccan and other imported seed. The Board earnestly emphasises that if the paddocks are kept clean, weeds kept down, and greater care exercised in harvesting operations, a tremendous wastage would be saved and profit correspondingly increased to the grower. A large proportion of the wastage is made up of broken seed; surely a little care exercised in machine adjustments would well repay the grower and save the seed. A little reflection on the part of growers will convince them that, apart from the loss occasioned by cost of extra cleanings and gradings, there also is the cost of railage on this wastage.

After 1st December, no imported seed will be accepted at any port in the Commonwealth, so it is up to the Darling Downs farmers to honour the confidence which the Federal Government has shown in their splendid soil and climate, and grow at least all the seed that the Commonwealth consumes. The soil will produce the crop; the grower should therefore do his part and market tip-top canary seed. The Australian market can absorb about 1,500 tons of canary seed during the year, so there is plenty of margin for increased acreage.

A New Sanctuary for Native Birds.

Murray's Lagoon, near Rockhampton, was declared to be a Sanctuary for the protection of Native Birds in 1904. An Order in Council has now been passed rescinding this declaration, and declaring Reserve R. 217 (area 690 acres) containing Murray's, Yeppoon, and Crescent Lagoons, parish of Rockhampton, county of Livingstone, to be a Sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

No Open Season for Opossums.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has announced for the benefit of trappers and other interested parties, that he desires it to be definitely understood that an open season will not be proclaimed for opossums during the present year. He desires also to point out that no traffic in opossum skins will be permitted, and in this connection the co-operation of the Police and the Railway Department has been sought. The Minister also wishes to impress on trappers the fact that sales of opossum skins cannot be conducted until an open season is again proclaimed.

Regulations under the Farm Produce Agent Actss.

Regulations have been passed under the Farm Produce Agents Acts rescinding all previous Regulations and substituting new ones therefor. The chief difference between the old and new is that the new ones clearly specify the nature of books to be kept by a produce agent. The Registrar, however, is empowered to exempt any agent from adhering to the particular form of accountancy mentioned, provided that the system in use enables all sales to be properly traced. It is now compulsory for an agent to keep all his books and documents at night in a fire-proof safe.

Papaw Levy Regulations.

In 1928 a levy was made on all papaws, for advertising purposes. At the end of 1929 there was an amount of £143 debit outstanding, which has been spent by the Committee of Direction on the growers' behalf. In response to a request from two Local Producers Associations, the Committee of Direction conducted a ballot of papaw growers on the question as to whether a levy be struck again this year in order to wipe off the debt. A total of 226 ballot-papers were posted, and 116 were completed and returned, of which 94 were in favour and 22 against the levy. The Committee of Direction accordingly recommended that additional Regulations be issued under the Fruit Marketing Organisation Acts to provide for this levy, for advertising purposes. As a result, the Governor in Council has now approved that Regulations 189 to 199 under the Acts referred to be issued to provide for a levy on papaws by the Committee of Direction.

The levy shall be payable by growers of papaws marketed from the 26th June, 1930, to the 27th June, 1931, at the rate of one penny per bushel case. The levy shall be collected by all agents, and paid to the Committee of Direction fortnightly. In the case of papaws sold privately, the grower must furnish monthly a statement of realisation of such sales, and pay to the Committee of Direction the amount of levy due. The books of any agent may be inspected by any authorised officer of the Committee of Direction to ascertain whether the Regulations are being complied with. Any person failing to pay the levy, or otherwise committing a breach of these Regulations, shall be guilty of an offence, and be liable to a penalty not exceeding £20.

Swine Fever.

In an address at a recent meeting of the Pig Industry Committee of New South Wales, Dr. H. R. Seddon, Director of the Glenfield Veterinary Research Station, New South Wales, stated that fresh pork may maintain its infectivity for seventy-three days, and it is possible that, under certain circumstances, this period may be longer. So far, all experiments aiming to show that bacon made from infected pigs could spread the disease have been negative, but, of course, that does not prove that bacon and ham are always harmless. It is certain, however, that the danger from bacon, &c., is nowhere near so great as that from fresh or frozen pork.

Mildew on Bacon.

One of the objections to farm-cured bacon is that there is great difficulty in preventing the development of a heavy growth of mould on the cured surfaces after the curing, drying, and smoking processes are complete and the bacon is stored away for future use. The trouble is not a new one; indeed, it has been a source of annoyance both to bacon factories, provision stores, and the farming community for many years, and much loss has been occasioned in subsequently freshening up and trimming goods so affected. Curers and chemists alike have for ages been puzzled over the rapid growth of the mould, but in recent years research has paved the way to much better results, through which, nowadays, there is not nearly the same amount of trouble as formerly. It is apparent that the mildew which develops after the smoking process is complete and the bacon has been stored is largely due to an excess of moisture both in the meat and in the atmosphere. Bacon is not the only class of goods that suffers, especially in the semi-tropical and tropical districts. Some curers even believe that the growth of mildew is encouraged by insufficient even though prolonged drying of the meat, and by the smoking process being carried out in a room or portion thereof which does not allow of rapid and thorough smoking; for bacon is often smoked by merely being hung up on rafters in a smoky kitchen or by being hung up in a chimney away from the heat, yet in the track of the smoke from a continuous fire.

The trouble is not so apparent in cold climates or in dry years, but must be looked for in most parts of Australia, especially during moist or humid seasons. Removal of the mould does not necessarily ruin the bacon or reduce its value, nor does the growth of the mould indicate decomposition, or that the meat is unfit for use, for the mildew is readily cleaned off, and if the meat is then thoroughly dried and rubbed over with a cloth soaked in olive or salad oil it will keep clean for quite a long time. In fact, the growth of mould would be checked very largely if this precaution of oiling be taken in the first instance, as soon as the smoking is complete and the meat has cooled off.

Storing in a dry atmosphere where the temperature is normal to cool will also be effective, though even under the best management there will be a limited growth of mould or mildew in due course. Provided the meat has not been otherwise neglected or depreciated in value and is in good state of prservation, there is no occasion to seriously worry over the appearance of mould.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

DIPHTHERIA.

Of all the epidemic diseases which attack our children, diphtheria is the most treacherous and the most terrible; treacherous because it so often begins as a slight sore throat, of which the child may make no complaint; terrible because within two or three days a previously healthy child may be struggling for its life against a blocking of its air passages, or the absorption of a deadly poison, or against both at the same time.

The Seriousness of a Sore Throat.

It is so easy to make mistakes at the beginning of the illness. Diphtheria may be very difficult to distinguish from other forms of sore throat, and diphtheritic croup may be exactly similar to simple croup, except that it lasts longer and, if untreated, is almost surely fatal. If a child has a sore throat, that throat must be carefully examined by a doctor, and if an attack of croup in the night does not disappear in the morning a doctor must be sent for. Of course, some children are subject to attacks of simple croup, but this does not give any assurance that they may not be attacked by diphtheritic croup. Many children have attacks of other kinds of sore throat, so like diphtheria that it needs an expert to distinguish them, and even the expert may be in doubt, and may for safety treat the disease as diphtheria, without being certain as to its nature.

The Cause and Cure.

Science has discovered the cause of the disease to be a living organism—the diphtheria bacillus. The bacillus can be easily grown on jellies and in broths, and as it grows there it secretes its poison or toxin just as it does in a child's throat. When this toxin enters the living body, the body cells react by secreting an antidote or antitoxin. If sufficient antitoxin is formed soon enough, the child recovers, if not, it dies. Too often the antitoxin formed is insufficient, and the child is overwhelmed by the poison; or the membrane formed on the throat owing to the irritation of the toxin spreads into the air passages and the child is choked. By injecting gradually increasing doses of anatoxin (we will explain this word presently) under the skin of a horse, this animal, while remaining in good health, secretes so much antitoxin, that a small quantity of its serum injected under the skin of a sick child, before it is too late, will neutralise the toxin and save the child's life. If every case of diphtheria were recognised within the first two days, and the remedy used promptly, deaths would be extremely few. Unfortunately, the disease will never be always recognised within the first two days, and with each additional day the death rate rises. Antitoxin has greatly reduced the death rate from diphtheria in Queensland, but there are still many deaths. Although the deaths from diphtheria are less numerous, the number of cases of diphtheria are no less, indeed, they may be more numerous. Antitoxin will save the individual patient, it does nothing to prevent the epidemic. We have saved many lives, but we have failed to prevent diphtheria.

It was hoped that by swabbing the throats of all contacts with diphtheria cases, examining the swabs for diphtheria bacilli, and isolating all carriers as well as patients until three negative swabs at forty-eight hours intervals have been obtained, epidemics might be prevented. This policy may have done some good, but after a fair trial it may fairly be said to have failed to prevent the disease. The reasons are simple. As a matter of practice it is impossible to get hold of all diphtheria carriers, and even thirty "negative swabs" would not be conclusive evidence of the absence of diphtheria bacilli. Furthermore, a large proportion of

the bacilli so discovered are not virulent, and to test all the samples of virulence is scarcely practicable. If all children were trained to keep their fingers out of their mouths and away from their noses, there would be less diphtheria. But such a result would entail many years, or several generations, of education, and even then no absolute safety would be secured.

Our Search for Safety.

In our search for safety we must study the natural history of the disease. If an exceedingly minute quantity of diphtheria toxin be injected into the skin a small area of inflammation follows in those who are susceptible to diphtheria, but no inflammation follows in those who are immune. This is known as the Schick test. In young infants the proportion that react to the test is small. Most of them have derived some antitoxin from their mother's blood, and perhaps some from their mother's milk. From one to three years of age all react—they are all susceptible. Each year after that the percentage that reacts becomes smaller, and after fourteen years it is again low. Between three and fourteen years almost all children have absorbed some diphtheria poison, and most of them become gradually immunised. But in a proportion of these children either from great natural susceptibility, or a massive dose of infection, or a temporary weakening of resistance from a "cold," a tonsilitis, or other infection, there results an acute and dangerous illness. Of recent years we have been able to immunise susceptible, that is "Schick-positive" children. By a simple chemical process diphtheria toxin can be made harmless, without losing its protective power. After two injections of this "anatoxin," as it is called, about 90 per cent. of susceptible children have been made immune, after three injections 98 or 99 per cent.

Prevention of Diphtheria.

It is now possible to prevent diphtheria. It can be prevented at any age. During the first year of life preventive inoculation is under ordinary circumstances hardly necessary. From two to five years of age the death rate from diphtheria is highest and, consequently, the best time for immunisation is during the second and third years. But many children remain susceptible during school age, as indicated by the "Schick test," and for them also immunisation is advisable. Parents will naturally and rightfully inquire—

(1) Is it safe?

(2) What degree of protection will it give?

As to (1), we may say that over half a million children have been immunised, and that accidents have been extremely rare. With our newest methods no serious accidents have occurred. Those that have occurred have been profoundly sad, but in each case the cause of the accident has been discovered, and that it should occur again is nearly impossible. Our methods have much improved. As to (2), we must answer that the protection does not appear immediately, but that it is acquired to some extent within fifteen days of the first injection. The protective value of one injection is, however, insufficient. After three injections the protection given is very great, though not absolute. We have good evidence that it lasts for four years, probably it lasts from six to ten years. It should reasonably be expected to protect children throughout the susceptible period under ordinary conditions.

THE WOMAN ON THE LAND.

By F. O. BOSWORTH, B.A., Queensland Agricultural High School and College.*

DOMESTIC AMENITIES.

IN recent years much attention has been directed to the importance of hygiene in rural industry. By legislation and otherwise progress is being steadily made in the provision of healthy conditions for both man and beast. To the farmer regulations are sometimes irksome at first, but later he recognises their benefits and wonders how he carried on without the improvements effected under them. Probably there is no more conservative class in the community than the farmer. This is not to be wondered at, for his work is by nature a more or less regular routine. Ploughing, harrowing, planting, cultivating, garnering, milking, separating, cleaning utensils, cutting fodder, milking again and so on in the eternal round, follow one another as certainly as night follows day. His work is ordained for him and that done he retires to his downy couch without thought of alteration either in

* In a Radio Address through 4QG.

routine or crop. He wakes up one day to the fact that repairs are needed on some of his buildings—he wants new implements, in fact everything outside the house seems to have conspired to irritate him. The house alone seems to need nothing. His patient wife appears tired at night, but she has done so for years. The kitchen is still hot and on washing days the clothes hang on the line as usual. Everything seems all right and the wife carries on under conditions that would not be tolerated for five minutes by hired labour. "Keeping house" in the country is made one of the worst of jobs, when it should be, viewed in the right spirit, one of the best. Living on the land seems to engender with some people a domestic indifference that is fatal to all refinement and crushes out that vigorous womanliness that was so noticeable when the bride first crossed the threshold. Now, need this be? Are we bound to suppress all culture and refinement in the country? To these questions we, of course, give an emphatic "No."

Much may be done to lighten the burden of manual labour. Progress in civilisation may be judged by the amount of reduction in manual work. To what extent, it may be asked, has the actual manual labour of the farmer's wife been reduced during the last twenty years?

Comfort in the Kitchen.

Factories in which men and women work for eight hours a day at the maximum must satisfy stringent building regulations, and the equipment must be of a high standard. If the work can be accomplished by sitting down, then suitable chairs or stools must be provided. If the work is performed standing up then the height of the table is regulated to the least tiring position. When it comes to the house these provisions are often entirely neglected and no thought whatever is given to making the housewife's working conditions equally favourable. Compare them—eight hours a day in a factory under good conditions, with rest rooms and so forth, and sixteen hours a day in a house, the greater part of the time spent in an ill-equipped kitchen!

However, under the influence of organisations like the Country Women's Association and the Town and Country Women's Club, we are awakening to a fuller realisation of the situation. The general trend of their activities is towards improving the working conditions of the woman on the land, and the general social amenities of country life.

In Queensland, the climatic conditions call for large, well ventilated rooms so that the detached kitchen and living room combined seems to be the ideal arrangement. The advantages to be gained by this arrangement are:—

(1) Provision can be made for windows and doors on both sides to permit of cross ventilation.

(2) The housewife's movements are minimised when preparing meals.

(3) One room only needs cleaning up after each meal.

(4) The increased size of the room means a greater degree of coolness.

If preferred, the kitchen may be smaller with an alcove for dining. Equipment in the kitchen should be grouped to avoid unnecessary work. One square foot of glass area to five or six square feet of floor space in the kitchen will give ample light. The windows should be placed so as to allow of cross ventilation when open. Two small windows, capable of opening, one or either side of the stove recess will be found of great convenience, for they not only shed light in the darkness, but will carry off many of the fumes associated with cooking.

Too frequently our kitchens are mere shells. The outside wall whether of wood or iron forms the inside wall of the kitchen while the rough studs, rafters, and roof remain uncovered, forming a harbour for insect pests and dust. A lining on the inside adds to the attractiveness of the room, facilitates cleaning, and provides a desirable insulating air space and a cooler kitchen. A piece of concave moulding at the junction of the floor and wall and under which the linoleum can just pass will cut off corners in which dirt and dust usually accumulates.

Work is pleasant or unpleasant according to the mental attitude towards it, and the housewife will feel more contented and less tired if she works in a kitchen attractively painted and capable of being kept clean. The Americans have carried the equipment of kitchens to a fine art. They believe in plenty of cupboard space. Usually these cupboards are built into the walls, but it is doubtful if this arrangement would be satisfactory in Queensland owing to the possible invasion of ants and cockroaches which find harbourage in obscure corners and inaccessible grooves. Rags soaked in a solution of mercuric chloride and tied round the legs of dressers

and safes will keep out ants. One soaking will serve for three months. This solution is poisonous, so every care must be taken in its use. Cockroaches will eat almost anything. To get rid of them, a saucer containing dry plaster of Paris and another containing water is usually effective. The pest eat the plaster, becomes dry, then drinks the water and dies. Sodium fluoride sprinkled round their haunts will also rid the house of them. That is by way of digression.

To return to the kitchen equipment: Every kitchen should be provided with a sink, with running water and a suitable means of carrying away waste water. It is believed that this will be found the greatest labour saver among all the single pieces of equipment. When the sink has drain boards or work shelves on either side its usefulness is further increased. To get this convenience the house supply would, of course, have to be placed on high blocks. Experience will show whether it is necessary to have two tanks or one to supply kitchen needs. The carrying of all water up high steps is a wearying job, and no woman should be expected to do it, especially when we consider that a gallon of water weighs ten pounds. The enormous saving of time and energy by having a water tap inside the kitchen can readily be calculated.

The correct height for a working surface will depend upon the height of the worker and the nature of the work. A working surface with a height equal to one-half the worker's height is good for practically any kind of kitchen work. Constant bending down to a low height may in the long run result in serious physical disabilities. This is a matter, the importance of which has not yet been generally realised. When we consider that our housewives are also the mothers of future Australians we can realise that everything should be done to ensure the proper functioning of all here physical processes.

Household Pests.

In many parts of the country summer brings with it a plague of flies. It is to the kitchen that these disease carriers resort. Food has an attraction for them and once they get into the house they are not only an irritant to human beings, but are filthy in the extreme. Provision should be made to put all kitchen utensils behind closed doors. Glass doors on the dresser are preferable to wood, as the light prevents insects such as silverfish and cockroaches from staying there long. Where flies are bad, fly screens inexpensively made, should be placed over all open spaces and so provide a fly-proof kitchen. Working under such conditions is more congenial, irritation is reduced, health will not be affected, and the kitchen will be much cleaner.

This kitchen problem seems to be a tall order, but the health and comfort of the housewife is the first consideration, for upon her efficiency depends the efficiency of the rest of the household.

The Bathroom and the Laundry.

How many farms are there equipped with a bathroom and a laundry? Speak to the farmer about such things and he will tell you that he cannot afford the water. It would be more strictly true to say that sufficient rain falls, but that insufficient storage capacity is provided. In the wet season tanks frequently overflow and the water thus lost would more than provide for all laundry and bathing purposes. Here again the tanks must be perched on high blocks to provide the necessary fall. One finds often that the washing is done out in the sun; all water has to be lifted into the tubs and then the tubs emptied afterwards. All this labour could be obviated by a tank on high blocks fitted with a pipe and a tap over each tub. Where the house is on high blocks a laundry can be fitted up underneath. Concrete tubs set on to a bench of convenient height, with a waste water-pipe, saves a tremendous amount of unnecessary heavy manual toil; the cost of such convenience is comparatively small. As for the boiling arrangements, kerosene tins may serve, but a closed fire under a proper copper, situated close to the washing tubs, is much more economical on wood and human labour. Even if we eliminate the concrete tubs and have the tap over a bench of convenient height we shall eliminate much useless drudgery.

The enamel basin or half kerosene tin under the tap of the tank may be useful for cleansing the face and hands, but no person can be healthy without a regular bath. A small enclosure with a concrete floor can be made under the house and a length of piping from the tank will provide all that is necessary for bodily cleanliness—hence no more upsetting of other rooms, no more carrying of water and all the mess confined to one spot—less cleaning up, less work, more comfort and greater peace of mind.

When one considers the advantages and the low initial cost with which these necessites can be carried out by a handy man, the wonder is that people put up with primitive arrangements so long. A farmer who employs labour is compelled by law to provide these necessary conveniences, and yet they are not regarded as necessaries for his own household.

If the house were the limit of woman's activities her lot could be made reasonably happy, but when she has to take her turn in the dairy, manage the poultry, look after the kitchen garden and, perhaps, help in the field, we can understand why there is a disinclination for farmer's daughters to remain on the land. Anything that can be done to improve her conditions of life will do much to compensate for, possibly, the lack of other amenities. Love in a cottage may last, but it is doubtful if it will withstand many years of rude shocks and jars.

THE OCCURRENCE OF CANCER.

HOW ITS INCIDENCE CAN BE REDUCED.

Among the uses to which wireless telephony is put is the broadcasting throughout a nation or continent information of value alike to the individual or the community, irrespective of time or distance. "Public education," declared a leading medical authority at a recently held meeting at Brisbane of the Town and Country Women's Club, "in essential cancer facts, coupled with periodic medical examination, will go a long way towards reducing the incidence of cancer and the death rate from the disease." This informative address was broadcast throughout the State simultaneously with its delivery.

The term "cancer," said this medical authority, was synonymous with malignancy and connected a group of diseases characterised by the apparently causeless but progressive and persistent growth of the cells of a particular tissue in the human body. The doctor also adverted to the mystery surrounding the origin of the disease in any of its manifold forms, emphasising the fact that every cancer—and there were dozens of varieties—originally sprang from what was a normal cell or group of cells in the human body. Cancer in its first manifestation seemed to have its origin in a distorted type of growth assumed by a cell, or possibly a group of neighbouring cells, in an area which had been subjected for a longer or shorter period to some form of chronic irritation. In most cases the cells took on an abnormal tissue growth, which multiplied rapidly and formed the tumour mass.

The lecturer then explained that this tumour in its early stages was a purely local condition, but sooner or later, depending on its site, type, and rate of growth, cells broke away from the parent body, and, travelling by the blood and lymphatic vessels, were transported to distant organs, where they in turn multiplied and formed secondary growths, in the brain, lungs, spine and liver, for instance. It was usually from the inroads of those growths that the victims died. This served to show, the lecturer urged, the necessity for treating cancer in its local stage.

Giving instances of types of cancer, the lecturer said that certain types were associated with certain occupations, and were thus known as occupational or industrial cancer. For instance, there was a malignancy that affected the hands and forearms of cotton spinners using a certain type of lubricating oil on spinning machines.

He urged the necessity of submitting to an examination by a competent medical authority at the first indication of a suspicious growth, or even a superficial irritation which seems to be permanently established.

"Unfortunately," the lecturer went on to say, "the majority of patients, whether through fear or ignorance, or both, avoided seeing their doctors until the disease had become so widespread that a permanent cure was out of the question."

Throughout the civilised world investigation is continuously and persistently going on as to the origin and incidence of this dread disease. Until a few years ago the only treatment available was the removal of the tumourous growth by the surgeon's scalpel. Now, however, as the outcome of the unceasing physical research carried out the world over by doctors and surgeons we are able to call in the assistance of radium and the deep X-ray, which is to-day available in Brisbane and in other big cities of the State, and it is gratifying to know that these weapons against cancer will ultimately be installed in every public hospital of Queensland, and indeed

throughout the Commonwealth. But after all it is only by a campaign of public education that the disease will be mastered, and the fact must be persistently and continuously emphasised that if a cure is to be effected scientific treatment must be resorted to at the earlier stages of the disease.

TOPICAL NOTES.

Farm Life.

A Singleton (N.S.W.) farmer, Mr. Harry Wright, in the course of a paper read by him at the annual conference of his district Agricultural Bureau, had this to say on the necessity of making farm life profitable and happy:—Farming conducted on the right lines was the most independent and happy life that could be selected, and a mixed farm could be started in a small way without much capital, provided plenty of will power, common sense, and energy were put into the job. The working together of the members of the family put the farmer in a better position than any other tradesman.

Dairying, Mr. Wright considered a safe occupation to follow as a basis on which to build a mixed farm. Choice of suitable land, of good types of cattle, and the adoption of good business methods were stressed as essential to success, while a comfortable home with pleasant surroundings was important. Pig-raising was a good adjunct to dairying, but the farmer should ensure that he raised attractive pigs of the type desired by buyers. Poultry, fruit, bees, and vegetables were also good sidelines.

The adoption of up-to-date methods was important, and farmers and their families should join up with the Agricultural Bureau for educational, economic, and social benefits. Junior farmers' clubs to help in the scientific training of youths on the land should be encouraged. It was necessary to instil into the boys what a healthy and happy life the man on the land leads as the creator of new wealth.

In conclusion, Mr. Wright stressed the duty of parents in relation to keeping their children on the farms, by making their lives not only attractive but profitable.

The Medicine Chest.

Every home should have a measuring glass for medicines, so that the inmates shall not have to rely on teaspoons and tablespoons for measuring purposes.

The best "safety first" maxims are those concerning the medicines chest. Every mother should read the following suggestions:—

Keep all medicines together in one cupboard.

Never take medicine in the dark.

Always look at the label and read the directions before taking a dose of medicine.

Never increase the dose, or take it more frequently without consulting your physician if it is taken under his orders.

Pour from the bottle with the label upward. This keeps the label clean and legible.

Never take prescription medicine originally intended for others; the drugs it contains may be entirely unsuited for your condition, and be actually harmful.

Capsules, pills, and tablets should always be taken with a few swallows of water, unless otherwise directed by your physician.

Keep medicine out of reach of children; keep the cupboard locked, if possible.

Keep capsules, pills, and tablets in a dry place—moisture may spoil them.

Always keep medicine bottles, boxes, jars, or tubes tightly corked, or with the tops securely on.

Keep ointments and salves securely closed, and in a cool place.

Never interchange tops or covers on pill or powder boxes if they bear directions regarding use. Dangerous results may occur.

After using an eye water in an eye cup, do not pour it back into the bottle, as this is apt to contaminate the preparation,

MANURE FOR CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep,. and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil, and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

FIVE REASONS IN FAVOUR OF THE HOME VEGETABLE GARDEN.

(1) Fresh vegetables, especially vegetables containing vitamines, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

(2) The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

(3) Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

(4) It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and not unusually generous reward are to be gained from this work.

(5) The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

Farm Notes for September.

With the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghums, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

THE FARM GARDEN

It is not necessary to discuss whether the vegetable garden or the flower garden is the more valuable; we ought to take it for granted that both are essential to the complete country home. Fresh, succulent vegetables, full of vigorous vitamins, and appetising with a thousand precious ethers, make the farm table something that city folk can barely imagine.

Yet man shall not live by bread alone, and if we need vegetables for our bodies we equally need flowers for our souls—for that aesthetic hunger for the beautiful that is inherent in all of us.

Vegetable-growing is usually the task of those members of the farm household whose ordinary occupation is not laborious, muscle-straining work on the farm; and to them it represents exercises, recreation, stimulation of the bodily functions, and health.

For the younger members of the family vegetable-growing provides education in soil science, in cultural lore, in the elements of breeding, as well as in those qualities of the mind that are stiffened by adversity and nourished by success. There are pests to fight, frosts to guard against, air and water to put into the soil, and all the processes of nature to assist.

And vegetable eating is the cure for many disorders, and the proved preserver of health. Furthermore, the vegetable garden is the soil in which the herb "thrift" thrives most vigorously. A productive vegetable patch shrinks the store bill, and doctors' and chemists' bills. It does ever so much more—it trains the young people in ways of health and ways of thrift, in which they will walk all their lives. Every farm should have both a vegetable and a flower garden book, to be able to supplement all the family knowledge of gardening, and as a reminder of what to sow and when to sow it.

Economists tell us that the fault of Australian agriculture is that it tends too much to specialise in one crop or other product, and thus the farmer is up against it when prices of his staple are low. There are sidelines that the farmer with spare labour and spare capital might wisely take up; but there is one sideline that calls for practically no capital, and for only spare-hour labour—the vegetable garden. And though vegetables may not bring much hard cash on to the farm, they will prevent a fairly considerable sum from going out.

Some farmers are rather contemptuous about vegetable gardening. Let such a one agree to fence, plough, and manure a quarter of an acre and pass it over to mother and the girls to make what they can of it. Let him agree to purchase all the vegetables needed for the farm table at current rates, and to market the surplus for his women-folk.—"The Country Woman."

Orchard Notes for September.

THE COASTAL DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, 2 to 3 eyes are left spaced around the butt, any surplus ones being removed. The top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —2 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1930.		September, 1930.		MOONRISE. Aug., 1930.	MOONRISE. Sept., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.37	5.19	6.10	5.34	a.m. 10.50	a.m. 11.29
2	6.36	5.20	6 9	5.34	11.25	p.m. 12.21
3	6.36	5.20	6 8	5 35	12.0	1.14
4	6 35	5.21	6.7	5 35	p.m. 12.43	2.8
5	6 34	5.22	6 6	5.36	1.33	3.5
6	6.33	5 23	6.5	5 36	2.25	4.0
7	6.33	5.23	6.4	5.37	3.19	4.53
8	6 32	5.24	6.3	5.37	4.13	5.47
9	6 31	5.24	6.2	5 38	5 8	6.39
10	6.30	5.25	6.0	5.38	6.4	7.31
11	6 29	5.25	5.59	5.39	6.52	8.25
12	6.29	5.26	5.58	5 39	7.50	9.21
13	6.28	5.26	5.56	5.40	8.42	10.22
14	6.28	5.27	5.55	5.40	9.34	11.23
15	6.26	5.27	5.54	5.41	10.27	...
16	6.25	5.28	5.53	5.41	11.27	a.m. 12.25
17	6.24	5.28	5.52	5.42	...	1.27
18	6.23	5.29	5 51	5.42	a.m. 12.27	2.28
19	6.22	5.29	5.50	5.43	1.31	3.24
20	6.21	5.30	5.48	5.43	2.34	4.12
21	6.20	5.30	5.47	5.43	3.39	4.53
22	6.19	5.31	5.46	5.43	4.41	5.30
23	6 18	5.31	5.45	5.44	5.35	6.9
24	6.17	5.32	5.44	5.44	6.21	6.40
25	6.16	5.32	5.43	5.45	7.2	7.14
26	6.15	5.32	5 42	5.45	7.36	7.53
27	6.14	5.33	5.40	5.46	8.11	8.34
28	6.13	5.33	5.39	5.43	8.45	9.21
29	6.12	5.33	5 38	5.47	9.19	10.16
30	6.11	5.34	5.37	5.47	9.57	11.7
31	6 10	5.34	...	...	10.40	...

Phases of the Moon, Occultations, &c.

1 Aug.	☾	First Quarter	10 26 p.m.
9 "	○	Full Moon	8 58 p.m.
17 "	☽	Last Quarter	9 31 p.m.
24 "	●	New Moon	1 37 p.m.
30 "	☾	First Quarter	9 57 a.m.

As Mercury will be at its greatest distance, 27 degrees, east of the Sun on the 25th, it will be at that distance above the western horizon when the Sun sets. Though the brilliance of its disc will be less than one-half of the maximum amount, it will afford a favourable opportunity for observation when the daylight has sufficiently faded. Venus, being 17 degrees higher up and somewhat to the south, will, of course, be much more noticeable.

On the 27th, the Sun will be slowly passing from west to east of Neptune, but more than half a degree further south, Neptune being about 2,800 million miles beyond it.

Mercury will set at 6·37 p.m. on the 1st and at 7·19 p.m. on the 15th.

Venus will set at 8·31 p.m. on the 1st and at 8·49 p.m. on the 15th.

Mars will rise at 2·46 a.m. on the 1st and at 2·32 a.m. on the 15th.

Jupiter will rise at 4·38 a.m. on the 1st and at 3·55 a.m. on the 15th.

Saturn will rise at 2·50 p.m. and set at 4·32 a.m. on the 1st; on the15th it will rise at 1.52 p.m. and set at 3·27 a.m.

When the Southern Cross comes into view after sunset on the 1st it will be bending downwards, slightly to the right, about 10 degrees west of the southern meridian. At the end of the month it will be much more noticeably inclined, and about 10 degrees further west.

8 Sept.	○	Full Moon	12 47 p.m.
16 "	☽	Last Quarter	7 12 a.m.
22 "	●	New Moon	9 41 p.m.
30 "	☾	First Quarter	12 57 a.m.

Apogee, 6th September, at 7.54 a.m.
Perigee, 21st September, at 2.54 p.m.

Soon after sunset on the 2nd it will be noticeable that the Moon and Saturn will both be very high overhead, the Moon being almost in the zenith at Warwick, and Saturn 6 degrees (the length of the Southern Cross) northward of it. Saturn, which was apparently moving slowly westward amongst the stars of Sagittarius, since the end of April will, like the Sun on 22nd June, seem to stop and retrace its steps, which it will continue to do till the end of the year when it will reach the same position it held about 1st May.

Venus will reach its greatest elongation, 46 degrees east of the Sun, on the 12th. It will remain upon the western horizon until after 9 o'clock, and its brilliance will continue to increase for another month.

Mercury will be passing from east to west between Earth and Sun on the 21st, but a transit will not occur, Mercury passing about 3 degsees south of the Sun.

The Sun will reach the equinoctial point, crossing the celestial equator at 4.36 a.m., on the 24th when there will be 12 hours night and 12 hours day.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

BUOYANCY of spirit and a general air of quiet and firm confidence in Queensland and its future were marked characteristics of the huge daily crowds at the Brisbane Exhibition, and something of that spirit of sane optimism was captured by our camera, as will be seen by our Show report, necessarily condensed, in the current issue. Pictures of the winners in the live stock competitions have been reserved for our October number. Pressure on space has also compelled the holding over of the third instalment of Mr. Currie's paper on The Brown Cut Worm, which will appear in our next issue. Mr. Easterby continues his interesting narrative of the development of the Queensland sugar industry, and the sugar section is otherwise well supplied. Tomato-growing in North Queensland is the subject of a short note by Mr. Duffy. The officers of the Fruit Branch have also contributed a valuable illustrated article on tomato culture, grading, and packing. Mr. Hardy, a well-known Northern horticulturist, contributes a brief account of his fruitgrowing experiences at Herberton. Results of a poultry-feeding test at Mount Gravatt are given, while Coccidiosis in Chickens is dealt with in a well-illustrated article by officers of the Poultry Section. Prospects of tobacco-growing in North Queensland are noted briefly. Plant breeding experiments at the Roma State Farm are described by Mr. Soutter. Mr. Shelton has a useful compilation on pig diseases, illustrated by two excellent black and white drawings by Mr. Helmsing, as well as numerous photographs. The art of rose culture is discussed by Mr. Heers in the Home and Garden Section. Other regular features of this month's Journal are well supplied with a wide diversity of interesting information.

The Royal National Association.

THE story of the Royal National Association was presented in concentrated form at its Fifty-fifth Annual Show at Brisbane last month. Probably no other institution has had a greater influence on the remarkable development of our rural industries, especially in the last twenty years. To what degree its useful purpose to Queensland has been proved can hardly be realised adequately; to what extent it will continue to radiate its influence and how far it will develop its greatness as a factor in the brightening and prospering of country life can be imagined more readily. For is not the Brisbane Show itself extraordinary evidence of the energy, the enterprise, and the vitality of rural industry that it is the Association's job to develop, and upon which rests the soundness and completeness of our existence as a nation? The Association has had the good fortune to have big men at the head of its affairs. It is no wonder, therefore, that it is a fountain of progressive ideas and a strong educational force. And that, no doubt, is the reason why it is never guilty of taking a narrow view nor of pessimism in any of its constrictive or depressing forms. It stands for better farming, better stock, better business, bigger returns to the man on the land, and higher service to the State. The Brisbane Exhibition in its comprehensiveness and completeness was an impressive example of the high standards the Association has set, as well as of the immense value of its national service.

The Brisbane Show—A Great Education.

WHEN asked to give some of his impressions of the Show, His Excellency the Governor, Sir John Goodwin, said that one strong impression was the friendly relations existing between all exhibitors, despite what were termed the hard times for the country. There was a magnificent display. It was the fourth Show he had seen, and on each occasion there had been a big improvement. Sir John was impressed with the advancement shown in the beef and dairy cattle, especially with the high standard of the Hereford and Shorthorn breeds. "The dairy cattle are simply splendid," he added. "I have seen the Illawarras, Jerseys, Guernseys, Ayrshires, and other breeds, and have noticed their superior quality. I observed that both the big breeders and the smaller breeders have carefully selected their animals, and are maintaining a standard of the highest quality."

Speaking of the meat exhibit, His Excellency said he regarded it as one of the highest value in the Show. He could see that the best and most scientific methods were being followed to produce beef of the best quality.

Referring to the district exhibits, the Governor remarked: "I regard them of the utmost importance, and they convey to me an impression that will be always remembered as proof of the greatness of the country." He had yet to have a close look at the fruit and one-farm displays, observing that he had been at the Exhibition every day, but there was so much to observe that all could not be seen in the four days that he had been at the grounds.

"The National Association," continued His Excellency, "is doing valuable work for the whole of the State, and, as the people in the cities have not the opportunity to visit the country except for short periods, the Association is bringing the value of the country under the notice of the cities. There is an immense educational value to the younger generation and to the elder people, who can learn something from every day that a visit is made to the Exhibition, for by daily intercourse there is an interchange of ideas which must be of benefit to the individual and the people of the State generally. I am struck by the friendly spirit amongst all people."

The Council of Agriculture—Organised Marketing.

SPEAKING on the occasion of his unanimous election to the Presidency of the Council of Agriculture, the Minister for Agriculture and Stock, Mr. Harry F. Walker, said that in accepting the position he recognised that it brought greater responsibilities to his shoulders because of the great amount of work performed by the Council of Agriculture. During the past twelve months he had watched their work as

closely as his time permitted. In his travels he gained much information about the problems they had to face. As a result he had been particularly keen in furthering the interests of the Council.

He looked upon organised marketing as the most satisfactory way of disposing of the surplus products of the State. He had heard it stated that the cost was too great, but those critics would be surprised if they saw actually what the cost was. Under organised marketing there was only one conclusion—that the farmer was better off now than ever in the history of Queensland. Organised marketing started in Queensland, and New South Wales and Victoria had followed suit by forming boards to control products. South Africa was also adopting the system, and in Great Britain a similar movement was on foot.

He as Minister considered that the executive committee and boards were doing good work. He praised their work and that of the secretary of the Council (Mr. C. Sheehy).

During the year he saw the need for the control of the maize crop, and he had decided to convene a conference of those interested to determine the policy of maize-growers. When a pool had been suggested previously there was opposition to its formation. The formation of a pool was of great importance to Queensland. He was also prepared to give consideration to the bacon people who were making an effort to place their industry on a better footing.

Mr. Walker congratulated the primary producers on the success of their year's work, and commended the spirit of co-operation that they had manifested, not only among themselves but with the Government, which viewed their efforts sympathetically and desired to help in every practical way in the solution of their pressing problems.

Room for Rural Expansion.

IN the course of a notable speech on the Address in Reply in the State House, the Minister for Agriculture and Stock, Mr. Harry F. Walker, reviewed the whole of the activities of his Department in their relation to the definite progress made by the primary industries during the year. Referring to the room for tremendous expansion that exists in our rural industries, he said:—

> When we speak of increased production we must first aim in the direction of inducing people to go upon the land, and to do so we must make conditions attractive not only for the older members of the community but particularly for the younger people, who have a right to enjoy the ordinary amenities of modern social life. If we have the courage to face realities, then we shall be able to overcome our present difficulties. That end can be achieved only by setting aside party politics for the time being, although I should like to see party politics abolished for all time. We should work with the one common object of saving one of the greatest countries of the world. The prosperity of the State is bound up with the prosperity of the primary producer.
>
> . . . . In Queensland we have wonderful primary industries, from sugar in the North to fruit in the South, varying with climatic conditions possible only in a tropical and sub-tropical country like our own. With these industries in mind, one can only come to the conclusion that there is vast room for the development of these industries, particularly in view of the statements made by hon. members representing rural districts who have fully backed up my opinion in this regard. I am satisfied that we could launch out in many directions as we have never done before.
>
> . . . . . At this stage of our national development I cannot stress too strongly that the wellbeing of the Commonwealth is bound up in agricultural and other rural pursuits. The only sound way to secure continued increase in production is to improve farming methods, to eliminate the hazards of rural enterprise, and to apply the lessons of science to every branch of production. It has been said that every extra bushel of wheat per acre taken from the soil is worth £3,000,000 to Australia. Every insect and vegetable pest we learn to control saves enormous financial loss. Every application of new knowledge to pasture and soil management and animal husbandry means an immense amount of added wealth to the country.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART IX.

(b) Review of the Industry since Federation.

(*Continued.*)

IN 1913 the wet season was a particularly heavy one, and caused a number of floods in the sugar districts between Cairns and the Herbert River. The losses in the Innisfail district were severe, and many areas of land on river banks were washed away and a number of buildings destroyed. In some instances large quantities of sand and gravel were washed in from the rivers, causing much loss to canegrowers of valuable land. Floods, too, occurred in parts of the Cairns and Herbert River districts, though the damage was not so great. Floods were also experienced in the Baffle Creek and Bundaberg areas. In spite of these unfortunate happenings the 1913 crop was the largest to that date, amounting to 242,837 tons, the previous record yield being 210,756 tons in 1910.

The introduction of motor tractors began about this period, but they were looked on then as more or less of an experiment. Favourable reports, however, were given of their work, and they commenced to rapidly increase in numbers in the succeeding years.

During this year an effort was made by Messrs. Rankin, Swayne, and Caine, M's.L.A., representing the sugar constituencies, to have a Sugar Cane Price Boards Bill passed. It was not a Government Bill, and as a whole the Government did not support it, though the Opposition did. On the question that the Bill be read a second time, the voting was thirty-one in favour and twenty-eight against. The Bill, however, was not further proceeded with, which created much disappointment to many growers at the time. During the following year (1914) the Macnaughton Award in relation to labour in the cane fields caused commotion, and materially increased the cost of production. This Award and succeeding ones will be referred to in later sections.

Another Act in relation to sugar-mills was passed this year, but it was one that so far has never been made use of. This was an Act to provide for the establishment and management of co-operative sugar-mills. It provided that the Government might lend a sum equal to two-thirds of the capital cost of any sugar-mill to be purchased or built by a co-operative company for a term of twenty-one years bearing interest at 4 per cent. per annum.

At about the time the Act was passed one or two groups of farmers thought of purchasing or establishing sugar-mills, but such schemes never came to fruition. In one case a large milling interest, which considered their cane supply would be interfered with, purchased a lot of the land where it was proposed to run tramlines, and so put a "sprag" in the project, from which it never recovered.

At the end of 1913 the Sugar Experiment Station at Bundaberg was established.

The year 1914 was chiefly noteworthy for the outbreak of the great European War, which was destined to affect the sugar industry in no small degree amongst many larger issues. This subject, however, will

be dealt with in a later article relating to prices for sugar. At present it is sufficient to say that the enlistment of men from the sugar districts was considered to be the highest in Australia, as it has been stated that one in eight of the population enlisted. This amply bore out the Federal Royal Commission's support for the industry from a defence point of view.

The price for sugar was so low in 1914 that in some districts farmers for a time actually went in for a "strike" for an increased rate in the price to be paid for cane. The matter was settled, but it was an indication that farmers expected better treatment. Farmers at that time were faced not only with higher costs of production but with the increase that had been going on in the cost of living and the purchase of farming implements and materials.

It was about this time, too, that the influx of Italians into the industry in parts of North Queensland began to arouse more attention. The sale of a large number of farms in the Ingham district to Southern Europeans was taking place, whose standard of living was below our own at that time.

A most severe drought affected the cane areas in 1915, more particularly those south of Townsville. The Lower Burdekin district was particularly hard hit, especially on the Inkerman side of the river, where there was no irrigation at that time, and where hundreds of acres of cane died right down to the ground. The Inkerman Mill did not crush, and the Pioneer and Kalamia Mills had only small crops. The total yield of sugar for the State was 140,496 tons, compared with 242,837 tons in 1913 and 225,847 tons in 1914, and the shortage in the sugar crop was estimated to be about 114,000 tons compared with the consumption. As in the 1902 drought, written of earlier in this history, large quantities of cane were sold for forage purposes.

Acts affecting the industry passed this year were of a highly important nature. The first was the Sugar Acquisition Act to ratify the compulsory acquisition of raw sugar which had already been proclaimed, and the other the long expected Regulation of Sugar Cane Prices Act. Both of these will be referred to in later articles.

A Royal Commission on a phase of the industry sat during 1915. This was appointed to ascertain whether dissatisfaction existed in connection with the working of Central sugar-mills at Mackay, to suggest remedies for the removal of same, to recommend a method whereby the mills may be worked by suppliers of cane on the co-operative principle, and to make suggestions with reference to the compensation that should be given to merely land-owning shareholders who were not suppliers of cane to the mills. This Commission took evidence in relation to the Plane Creek, Pleystowe, and North Eton Mills. Dissatisfaction did exist at that time, but the subject was one of local interest, and the difficulties that were present then have since apparently been overcome.

The following year (1916) the once famous Dickson Award for sugar-workers created a tremendous stir amongst the millers and growers. The majority of the mills below Townsville closed down by way of protest, and several remained closed for a period of two months, while three did not crush at all. The mills above Townsville, however, did not close, the various managements stating that they were unable to do so.

During this year a Board of Inquiry on the sugar industry was appointed by the Queensland Government. The Board consisted of

W. J. Short (Chairman), M. B. Salisbury, and the writer, and the matters upon which they were to report were as follows:—

(1) The position of the industry in Australia with regard to the possibility of over-production;
(2) The wisdom of establishing additional mills;
(3) In the event of additional mills being recommended, the most suitable localities for same.

As was the case with the 1911 Commission, a number of applications had reached the Government for the erection of more Central mills. These were as under:—

(1) Cooktown;
(2) Bailey Creek, to the north of the Daintree River, between Port Douglas and Cooktown;
(3) Atherton;
(4) Freshwater (Cairns);
(5) Daradgee and South Russell (including the coastal lands lying between the Russell River on the north and the Johnstone River on the south);
(6) Banyan, Hull, and Tully Rivers;
(7) Long Pocket (Herbert River);
(8) Haughton River (29 miles from Townsville, on the North Coast Line);
(9) Silent Grove (Mackay);
(10) Yeppoon (Rockhampton);
(11) Rockhampton;
(12) Alton Downs (Rockhampton);
(13) Jardine (North Coast Railway, 21 miles north of Rockhampton);
(14) Stanwell, Woodend, and Bushley (22 miles west of Rockhampton);
(15) Mount Larcom (47 miles south of Rockhampton, on the North Coast Railway).

The Board visited all the above districts, held thirty-five sittings in twenty-two different centres, and examined 142 witnesses.

The following is a summary of its findings:—

Question 1.—The mills now in operation, with the assistance of South Johnstone, are capable of producing 355,000 tons of sugar in a season, and the Commonwealth consumption is 260,000 tons, with a yearly increase of some 5,000 tons, so long as the population maintains the present rate of progression. If sufficient cane were forthcoming to keep all the mills fully occupied, there would be an over-production of some 95,000 tons per annum; but, as the maximum yield in any one year so far has only been 265,000 tons, and Babinda, South Johnstone, and Inkerman Mills are capable of producing another 45,000 tons, there is no reason to anticipate a yield of more than 310,000 tons, increasing to 315,000 tons when the projected additions to existing mills are completed. It is consequently certain that, with the first season as good as that of 1913,

we shall be faced with over-production, though the steady increase in population year after year from natural causes will tend gradually to diminish the amount of such anticipated surplus.

Question II.—It would be unwise for the Queensland Government to erect additional sugar-mills at the present time and under present conditions. With some assurance of adequate protection, assuming that the policy is adopted of producing enough sugar to supply the consumption of Australia in years with average crops, then provision must be made about the year 1920 for an annual increase of 5,000 tons.

Question III.—When the time arrives for further mill construction, the applications submitted to us should receive consideration in the following order, subject to the provisos to be found in the summary at the end of Part III. of our report:—

(1) Banyan, Hull, and Tully Rivers;
(2) Bailey Creek;
(3) Daraji, South Russell, and Babinda;
(4) Freshwater;
(5) Long Pocket.

The provisos mentioned were—

(*a*) Bailey Creek.—If a survey by an engineer proves that satisfactory tramway connection at a reasonable cost can be made with the Daintree River lands over Thornton Range;

(*b*) Daradgee, South Russell, and Babinda.—If when the time arrives for dealing with this application it has been ascertained that the South Russell lands are not required by the Babinda Mill.

Up to the time of writing nothing further has been done in connection with the Bailey Creek lands, while the Daradgee, South Russell, and Babinda lands are now supplying the Babinda Mill.

The Freshwater proposition has also dropped out, the cane from there being supplied to the Hambledon Mill. The erection of the Central Mill at Tully will be dealt with later.

The idea of building a mill at Long Pocket, near Ingham, crops up every now and again. The Haughton River is now served by a mill that was transferred from Invicta, near Bundaberg; while the Rockhampton, Cooktown, and Atherton proposals are at the present time practically dead, and the Silent Grove lands, near Mackay, have now been opened up and supply cane to Farleigh Mill.

The sugar industry was still passing through a critical period in 1917, though the agreements between the Federal and State Governments had counteracted the effect of the Victorian and New South Wales Prices Boards in reducing the price of sugar.

Due to several of the mills being closed in 1916, as already mentioned, for a period of some two months, there was a large crop of stand-over cane in 1917, and this, with the return of good seasons after the 1915 drought, created a large crop of cane to be crushed, the largest ever handled to this date. Most of the mills made an early start, and for a while everything went on well. Then a big strike took place in the Southern States, which held up regular supplies of bags and lime, and prevented the sending of ships for the conveyance of sugar to the refineries. The district of Mackay, then not connected by rail with the

South, suffered most owing to its harbour disadvantages, and the mills had to close on two occasions for several days for want of sugar bags. Due to the transport of sugar being held up, every wharf and store in the sugar areas became congested. Many mills were compelled to add to their storage accommodation at a time when galvanised iron and timber for building purposes was almost unprocurable, and both at a very high price. A few of the Northern factories were obliged to store sugar within the mills, and the loss which ultimately ensued from the double handling required, payments for insurance and storage, and the deterioration of the accumulated sticks during the following wet season, was very high. The Lower Burdekin district did not commence crushing till late, and a good deal of cane had to stand over. The industrial troubles spread from the South to the North, and railway disturbances took place in North Queensland. The year generally, however, was particularly favourable to the growth of cane, and the yield of cane and sugar per acre has never yet been exceeded. The figures are as under:—

Year.	Tons of Cane Per Acre.	Tons of Sugar Per Acre.
1917	24·88	2·83
Average, 1903 to 1918	17·52	2·01

It is remarkable that we have never experienced another year like 1917, when the crops were excellent in all areas except the Logan. The leading district was the Lower Burdekin, which produced 37·77 tons of cane and 4·53 tons of sugar per acre. All natural conditions seemed to combine to produce big crops, and this supplemented by the large amount of standover cane accounted for the high returns per acre.

The yield of sugar in this year was 307,714 tons, constituting the record to date.

This good year from a climatic point of view was followed by a disastrous one, for in 1918 two of the severest cyclones experienced since Queensland was settled by a white population struck the coast causing serious loss of life and immense damage. The first of these two cyclones visited Mackay on 21st January, and was a terrifying experience to the inhabitants, a number of whom were drowned by the high tide, backed up by the cyclone which came up the Pioneer River and spread over a great part of the town. The force of the wind was tremendous, buildings were levelled, mills partly destroyed, telephone and telegraph lines blown over and inextricably tangled, and 6,000 tons of sugar stored at wharves and mills were totally destroyed.

The rainfall during the cyclone week was 63·13 inches, and for the month of January 85½ inches—much more than the average annual fall at Mackay. The news of this disaster did not arrive in Brisbane till the 24th January, and then only meagre particulars came to hand. On the 28th January, Brisbane papers stated that Mackay was in ruins, the buildings on Flat Top Island had been wrecked, and the light extinguished. Bad as the actual disaster was, it was greatly exaggerated at the time. One captain of a passenger boat passing Mackay wired to Brisbane that Mackay had been totally obliterated, and that nothing was left of the township. During this unfortunate occurrence twenty persons were drowned, buildings and churches were wrecked, the Sydney Street bridge was partly carried away—portion of it falling on the tender

PLATE 56.—EFFECT OF HIGH WINDS ON CANE.

"Brinawarr." The tender "Tay" broke from its moorings, got under the bridge before it collapsed, and was deposited on the river bank some little distance inland. During the height of the cyclone the mercurial barometer at the Post Office was not read, but the barograph recorded 27·55 inches, the lowest ever recorded in Australia.

In addition to the 6,000 tons of sugar absolutely lost, a great deal on wharves and in mill stores was badly damaged, and this had to be reconditioned. Fortunately, the Commonwealth Government came to the rescue, and promised to bear any loss in connection with the sugar that had occurred. But for the shipping delays and strikes in 1917 the whole of the season's sugar would have been removed before the cyclone occurred, and this great loss would not have occurred. It should remain an object lesson on the advantage of the rapid transport of stocks of sugar before the wet season sets in. At the outset it was estimated that 30 per cent. of the sugar-cane in the district was irretrievably ruined, but the ultimate loss was much greater than this; nor did the land recover the effect of the very heavy rains for some two or three years afterwards.

As if all this was not bad enough, a furious cyclone again visited the coast, centring principally at Innisfail and Babinda. This took place on 10th March, 1918. These two townships were almost completely wrecked, and eight persons were killed at Innisfail. The cane was greatly injured, and beautiful scrubs in these districts were largely destroyed.

At this time the cane in North Queensland was much further forward than at the time of the cyclone in Mackay, and it consequently suffered a great deal more damage from the actual wind. Rain and floods also interfered with the cane from the Herbert River to Proserpine. The giant scrubs about Cairns were badly knocked about, tangled and blown over, so that instead of the impenetrable jungle that usually met the eye, it was possible to see through the scrubs for very great distances.

Much damage was also caused to the sugar-mills in these Northern areas.

All the cane in Queensland was light this year, even in the districts not affected by the cyclones.

A few of the smaller sugar-mills closed down about this period, such as Goodwood, Miara, Waterloo, Nerang, and Baffle Creek.

The initiation of the Sugar Experiment Station at South Johnstone, near Innisfail, took place this year.

The year 1919 was another dry period and the crops were light, the yield of cane and sugar being even below the previous cyclone years. A maritime strike took place also which again held up bag supplies and transport of sugar. Six sugar-mills did not crush, due to the dry season, and much of the crop in Southern districts was sold for forage purposes.

During 1919 the Invicta Mill, in the Bundaberg district, was removed to the Haughton River district, between Ayr and Townsville.

Manures were very difficult to obtain at this time, nitrate of soda and sulphate of potash being unprocurable. Muriate of potash started to come into Queensland for the first time in any quantity, and soon began to be used in mixed fertilisers.

A second Federal Royal Commission was appointed this year, consisting of A. B. Piddington, N. C. Lockyer, and S. Mills. They were given a large number of questions to investigate, such as the natural

value of the industry, comprising acreage, capital invested, number employed, wages, production, Government control, protection, beet sugar, and Empire preference.

This Commission took a considerable time to carry out its investigations, and had to obtain three extensions of the period in which they were to make their report. The Commission was not of the same calibre as the first Federal Royal Commission, and proceedings were conducted on a free and easy plan—a go-as-you-please style—with everybody interrogating, so that questions and answers occasionally got mixed up in the report of the evidence which was not published in question and answer form, but in narrative fashion. The Commission sat into 1920. Persons outside the Commission were allowed to travel around with the members and to put questions to witnesses, very often in the middle of the Commissioners' own questions. The report ran into fifty-six pages, and the evidence to another 600 pages.

The Commission made a number of recommendations, including the general control of the cane sugar industry by the Commonwealth exercised through a body that might be called the Commonwealth Sugar Control, consisting of three Commissioners, and that an increase in the price of raw sugar from £21 to £22 per ton would be justified. This last recommendation would have given little satisfaction to the industry, but as a matter of fact the whole report fell dead on the action of the Prime Minister (Mr. W. M. Hughes) in materially enhancing the price in 1920 without any reference to the findings of the Commission.

The Commission's report was dated 27th February, 1920, and we may now go on to that year.

For some time past sugar-growers and millers felt they were being treated unfairly in the matter of price, and a conference took place at the Department of Agriculture early in 1920. At that conference it was decided that a deputation should wait on the Prime Minister of the Federal Government and request that the price of sugar should be increased from £21 to £30 6s. 8d., and that an agreement to that effect be made for a period of not less than three years. This deputation proceeded to Melbourne and afterwards met in Sydney with representatives of the Queensland and Federal Governments and other branches of the industry. The Prime Minister finally acceded to the request under certain conditions, which will be dealt with in a succeeding article dealing with the history of the course of prices.

The drought which affected the crop in 1919 persisted into 1920, February and March being abnormally dry. This following on the severe dry weather experienced in October, November, and December of the preceding year considerably shortened the crop, and though it recovered to a great extent above Townsville, it was unable to make any such recovery in Southern Queensland, where the crushing was again a small one.

A cyclone was experienced at Mossman in the early part of this year, which did a great deal of damage to cane and farmers' dwellings.

In the year 1921 the industry was blessed by a good season, and this fact, combined with the better price for sugar, gave a great impetus to sugar-growing in the following years. The rainfalls at some of the far Northern sugar areas were particularly heavy, and it was at this time that a beginning was made of opening up further new areas of

land for canegrowing to supply existing mills. Improved railway communications assisted matters, the line from Brisbane to Mackay being opened for traffic in September of this year. This led to considerable settlement to the south of Mackay for sugar-growing. The yield of sugar this year, though it did not come up to 1917, was the largest since that date—viz., 283,198 tons of sugar.

It was felt at this time that this rich tropical belt of fine land, comprised in the Banyan and Tully areas, between Cardwell and Innisfail, should be opened up for sugar-growing. The settlers in that district had taken up a good deal of the land in the hope that a mill would be erected, and it was one of the locations included in the recommendations of both the 1911 and 1916 Commissions, standing first on the list of the latter. The steps taken towards the erection of the Tully Mill will be dealt with in the next section.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

WIREWORM DAMAGE.

In connection with the considerable damage to cane caused by wireworms in the Mackay district, the Assistant Entomologist, Mr. R. W. Mungomery, recently visited that district, and in reply to inquiries as to advice on this subject has submitted the following notes to the Director of Sugar Experiment Stations, and these notes are now made available for publication:—

From information gathered during the course of my recent investigations on the wireworm pest in the Mackay district, it seems that the life cycle of the insect which is responsible for the greatest amount of damage there is of at least a year's duration or more, and moreover, the period of oviposition of the adult beetles or "click beetles," which are responsible for the appearance of wireworms, appears to be a very protracted one. From this it will be evident that the pests are active over a considerable portion of the year, and there appears to be no quiescent period during the time when the greater part of the cane planting is carried out in the Mackay district. For this reason, no safe planting time can be recommended. At best, one must endeavour to plant during the warmer months of the year—i.e., early planting in March or April and late planting in August and September.

In combating wireworm attack, the essential point to keep in mind is to get the plants away as quickly as possible, and any means that will bring about this desirable end should be employed. By planting, therefore, in these warmer months, every encouragement is given for the plant to strike quickly, maintain its rapid rate of growth, and soon get past the critical period during which it is liable to injury. To plant in June and July in land where wireworms are suspected of being present is usually disastrous, for at such times plants are very slow in coming away, and are much more liable to injury.

Wireworm attack is most severe on low-lying land which is poorly drained, and which, in consequence, remains wet and cold. On this type of land more attention should be paid to bedding, and the water furrows deepened sufficiently to allow the water to flow off as quickly as possible. Though it is wise to drill fairly deep furrows when lining out at the time of planting, only a small amount of earth should be filled in as a covering for the plants, and this will facilitate rapid germination.

Good thick plants, of vigorous growth, should be used, and spacing should be close, so that if one plant is damaged, and a miss results, blank spaces between stools will not be so great.

After these precautions have been taken, it may still be found that wireworms are responsible for sufficient damage to cause annoyance. Obviously it is futile to soak the cane set in any poisonous solution, in the hopes of poisoning the pests, for this solution merely protects the set and not the growing shoot, which is the portion mainly attacked. The reputed remedy of using basic superphosphate in the drills at the time of planting seems to have yielded no results to substantiate the claims made for this fertiliser in this connection. The use of sulphur mixed in with other fertilisers likewise appears to be a failure in preventing attack.

Recourse must then be had to the use of some repellent, and experiments have been laid down on certain farms in the Mackay district, using the following chemicals:—

(1) Crude naphthalene sprinkled in the furrow just above the plant, at the time of planting and at the rate of one-eighth ounce to each cane set.

(2) The above quantity of naphthalene mixed with eight to ten times its weight of burnt lime and applied similarly to the former. The lime is used as a diluent, and also with the object of keeping the ground more open and allowing a better vaporisation of the naphthalene.

(3) Dropping orthodichlorobenzene at regular intervals in the drills at the time of planting.

Although it is premature to discuss the relative value of the above chemicals in warding off wireworm attack, it is hoped that some measure of relief will be gained from the results of these experiments, and farmers are advised to follow along the lines suggested above. Crude naphthalene is obtainable from Taylors and Elliotts Ltd., Charlotte street, Brisbane.

The use of burnt lime at the rate of 30 cwt. to 2 tons per acre also appears to have yielded lasting results. The lime should be applied before the second or third ploughing. It is not claimed that the burnt lime will have any immediate insecticidal action, but it renders the soil in better physical condition, and whether or not it has any other effect on wireworms is not yet quite clear; however, evidence points to the fact that cane planted on land treated with burnt lime has suffered no damage and excellent crops have resulted. Growers would be well advised to give this treatment a thorough trial in a small way.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS.

Growers who are contemplating fumigating their cane next year to control grubs should order their materials early, as there is a very large demand for these materials, and Australian stocks are limited. The order should be placed early enough for a supply to come from England should the agents not have enough on hand to fulfil requirements.

Names of firms supplying the necessary fumigants are available on application to the Bureau, and, if possible, it is better for growers to obtain fumigants through their local board or association, as most firms offer a reduction in price for large quantities.

Neither paradichlorobenzene nor carbon bisulphide deteriorate in any way as long as they are kept closed up in their original containers, so it is far better to order early than to wait till grubs appear on the farm and then be disappointed because fumigants are unobtainable.

Army Worms.

Towards the end of September invasions by the army worm or plague caterpillar are very common, and in order to combat these pests farmers should keep on hand a spray pump of the knapsack type and supplies of lead arsenate and Paris green. Directions for poisoning army worms have been published at frequent intervals, and assistance or advice may always be obtained by applying to the Meringa Experiment Station either by letter or telephone.

The main essential in dealing with army worms is for remedial measures to be adopted at once, as caterpillars are capable of stripping the foliage from a whole field of cane within a few days, and, although the cane will recover, yet it suffers a very severe check from the loss of leaves.

The "Frenchi" Grub.

Grubs of the "frenchi" cane beetle, which have been deep down in the ground for some weeks, will commence feeding again shortly, and patches of wilting cane will mark their appearance. The work of this grub almost always occurs in patches, and when these are noticed it is a good plan to fumigate stools in the neighbourhood of the damage.

Carbon bisulphide is very effective for poisoning "frenchi" grubs, and particulars of its use in that connection are published in pamphlet form by the Bureau.

Owing to the winter rains experienced throughout the North this year, these grubs will probably be much in evidence, but the amount of damage caused by them will be considerably lessened should further rains occur during September and October.

Moth Borers.

Headlands should be cleaned up as far as possible in order to minimise the damage caused by moth borers. The typical damage caused by these caterpillars consists of "deadhearts" in the cane, although sometimes they tunnel in the base of large sticks of cane. It is nearly always in close proximity to a dirty or grass-grown headland that the damage occurs, hence the advisability of keeping headlands clean and free from weeds.

General.

The liability of damage by quite a number of pests, including borers, grubs, and wireworms, can be lessened by regular cultivation of the inter-rows, and this point cannot be too strongly emphasised.

QUEENSLAND'S SUGAR PRODUCTION.

The Registrar-General, Mr. George Porter, has issued the following bulletin:—

On the 16th December, last year, an estimate of the probable result of the sugar crop for the 1929 season was issued from this Department. It was then calculated that there would be 508,332 tons of sugar made at 94 net titre from 3,592,189 tons of cane.

Final figures show that thought the tonnage of cane (3,581,265) was less than the estimate, the quantity of sugar made at 94 net titre was 518,516 tons, or 10,184 more than the preliminary figure.

In 1928 the production of sugar at 94 net titre amounted to the record figure of 520,620 tons, which is 2,104 tons more than in the 1929 season. However, the 1929 yield is the next highest ever recorded in this State.

Thirty-five mills again operated during the year, and the particulars of the output in each sugar-growing district of the State is shown hereunder, figures also appearing for several previous years:—

Division.	Tons of Sugar Made at 94 Net Titre.				
	1925.	1926.	1927.	1928.	1929.
Rockingham	216,755	221,104	228,839	255,188	273,820
Edgecumbe	171,511	117,807	170,596	184,343	173,454
Wide Bay	85,360	42,669	78,757	75,850	63,287
Moreton	11,959	7,692	7,553	5,239	7,955
Total State ..	485,585	389,272	485,745	520,620	518,516

Note.—It should be here explained that though the total tonnage of cane crushed and sugar made as shown for the State are final figures, the totals for the divisions for the year 1929 are liable to revision; figures for previous years are final in every case.

The figures quoted in this Bulletin for 1929 for divisions or districts show the actual quantity of cane crushed and sugar made at mills in each division, whether the cane was grown in that division or not. When complete statistics of the sugar industry are available it is possible to allot the cane crushed to the division in which it was grown, and a corresponding transfer of sugar is then also made.

Final figures will appear in the printed report of the Registrar-General on agricultural production. They will probably show a still greater increase in production in Rockingham and a still greater decrease in Edgecumbe when compared with 1928 production.

It will be noted that though the total production decreased in 1929, there was an increased output in the far Northern District (Rockingham) of 18,632 tons compared with 1928, and also of 2,716 tons in the Southern District of Moreton. These increases were, however, more than counterbalanced by a decrease of 12,563 tons in the Wide Bay divisions, and 10,889 in Edgecumbe. The percentage of the total production in each division was—Rockingham 52.81, Edgecumbe 33.45, Wide Bay 12.21, Moreton 1.53.

The weight of cane crushed during the last five seasons, together with the area from which such cane was taken was—

Year.	Tons of Cane.	Acreage.
1925	3,668,252	189,466
1926	2,925,662	189,312
1927	3,555,827	203,748
1928	3,736,311	215,674
1929	3,581,265	*223,730

* *Note.*—The acreage for 1929 is an estimate made by the mills only, the final figures from the Agricultural Collectors' books will not be available for about a month.

The yields per acre for the 1929 season were 16.01 tons of cane and 2.32 tons of sugar at 94 net titre, but these figures are liable to revision when the final figure for the area crushed is available.

The average tons of cane required to make one ton of sugar were 6.91 compared with 7.18 in the previous year.

Similar figures showing the percentages in each district in 1929 were—

District.	To Each Acre Crushed.		Tons of Cane to Make one Ton of Sugar.
	Tons Cane. *	Tons Sugar. *	
Rockingham	19·49	2·91	†6·70
Edgecumbe	14·18	2·09	†6·78
Wide Bay	12·01	1·49	†8·05
Moreton	14·40	1·89	†7·62
Total State	16·01	2·32	6·91

* Based on mill estimates of acreage only.

† Liable to revision.

Percentages for five years for the State were—

Year.	To Each Acre Crushed.		Tons of Cane to Make One Ton of Sugar.
	Tons Cane.	Tons Sugar.	
1925	19·36	2·56	7·55
1926	15·45	2·06	7·52
1927	17·45	2·38	7·32
1928	17·32	2·41	7·18
1929	*16·01	*2·32	6·91

* Based on mill estimates of acreage only.

It will be noted that the sugar content this season was highest in the Rockingham (far Northern) district, followed in order by Edgecumbe, Moreton, and Wide Bay. The average sugar content for the State was higher than in any previous season.

The tonnage of cane required to make one ton of sugar has gradually decreased from 9.44 in 1900 to 6.91 in 1929, due both to improvement in cane varieties and higher efficiency in sugar mills. The following figures will illustrate the downward trend:—

Year.	Tons of Cane to Make One Ton Sugar.
1900	9·44
1905	9·27
1910	8·73
1915	8·20
1920	8·00
1925	7·55
1929	6·91

During the twelve months ended 30th June, 1930, approximately 180,694 tons of sugar were exported direct overseas from Queensland, the value of same being set down at £2,194,245, or approximately £12 a ton. This valuation has been made on overseas realisation prices and not on the local price, which is approximately £26 per ton. Previously the value of overseas exports of sugar has been been shown in export statistics on the basis of the Australian price. In 1928-29 198,120 tons were exported, the value on the basis of the Australian price being £5,189,752.

The value of cane crushed in 1928 was estimated to be £7,209,778, while the value of the output of sugar mills in 1928-29 was £10,810,466.

Sufficient data is not yet to hand to value the cane crushed in 1929, and manufacturing statistics for 1929-30 are only now being collected. Therefore, later figures are not available, but as the quantity of cane crushed in 1929 and the production of sugar therefrom was somewhat lower it may be assumed, seeing that the price obtained overseas was probably lower also, that the values will be less than those quoted for the previous year in each case.

The production of sugar in Queensland per head of population, in 1929, was 1,256 lb. It is estimated that the consumption per head is about 120 lb., the balance being available for export to other States or overseas.

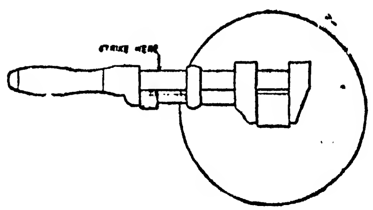
In addition to sugar made, the output of molasses from the mills during the year amounted to 15,861,948 gallons, which was disposed of as follows:—

	Gallons.
Sent to distilleries	5,638,465
Sold, &c., otherwise	215,933
Burnt	4,202,580
Food for stock	2,382,192
Used for manure	298,395
Run to waste	2,837,482
Held in stock, &c.	871,292

STARTING SCREWS.

IN CLEAN-OUT COVERS OF TRAPS.

Considerable difficulty, often-times, is experienced in starting the screws when



removing brass clean-out covers from traps. A good way is to give the wrench a few sharp strokes with a hammer at the point indicated in the sketch.

ROYAL NATIONAL EXHIBITION.

QUEENSLAND'S BOUNDLESS NATURAL WEALTH MIRRORED IN A GREAT SHOW—THE RESOURCES OF THE STATE ARRAYED IN FULL RANGE—A GENERATOR OF OPTIMISM AND AN EXEMPLAR OF OPULENCE—A FOUNTAIN OF PROGRESSIVE IDEAS—RIPE FULFILMENT OF EARLY PROMISE REVEALS A VISTA OF VASTLY GREATER ACHIEVEMENT IN THE YEARS AHEAD—THE VALUABLE WORK OF THE ROYAL NATIONAL ASSOCIATION—A COMBINATION OF COURAGE, INTELLIGENCE, INDUSTRY, AND ENTERPRISE.

Held on 11th August and following days, the Fifty-fifth Annual Show of the Royal National Association was an unqualified success from every point of view.

Every exhibit in the pavilion, paddock, and pen was an education, as well as evidence of high standards of skill, and of the wide field of opportunity and achievement that Queensland presents to the worker with hand and brain.

The Show represented an extraordinary diversity of production and rural interests, and from what was seen of the magnificent array of the products of Queensland industry it is hard to place a limit on any forecast of our future progress and prosperity.

In the ring stock were paraded in great numbers, and were never so uniform in quality.

The heavy horses, notably Clydesdales, showed no decline in breeding, condition, and schooling. Hunters, hacks, and remounts were remarkable for evidences of clean breeding and good training.

The cattle, both beef and butter, were splendid representatives of their respective breeds.

The pigs proved that the marketing lessons of the year had been well learnt, and that Queensland breeders are getting right away from valueless fat to lean meat baconers of early maturity and goodly weight for age.

Gathered together daily in the Grand Parade was as fine a collection of stock, for variety and quality, unexcelled in any show ring in the Commonwealth. The parade was a majestic spectacle, in which the monarchs of Queensland's pastures wore their honours royally and won the applause of a keenly critical crowd.

The 1930 Show stood as a working model of Queensland to-day, as a reflex of rural development, and as an epitome of industrial progress; it presented, in short, abundant evidence of all those things, spiritual as well as material, of which a nation is built.

THE OPENING CEREMONY.

DELIGHTFUL August weather, days of dazzling sunshine with a wintry chill still lingering in the shadows, favoured the Royal National Association for this year's Exhibition.

The Show was opened officially on Wednesday, 13th August, by His Excellency the Governor-General, Lord Stonehaven, accompanied by Lady Stonehaven, in the presence of an enormous gathering. Their Excellencies Sir John and Lady Goodwin assisted at the opening ceremony.

The Vice-Regal visitors were received by Mr. Ernest Baynes (President of the Royal National Association), who in the course of a cordial welcome said that in this year's Show thousands of good agriculturists and leading stud masters had come forward in one great co-operative effort to display the true wealth of Queensland and other States of the Commonwealth.

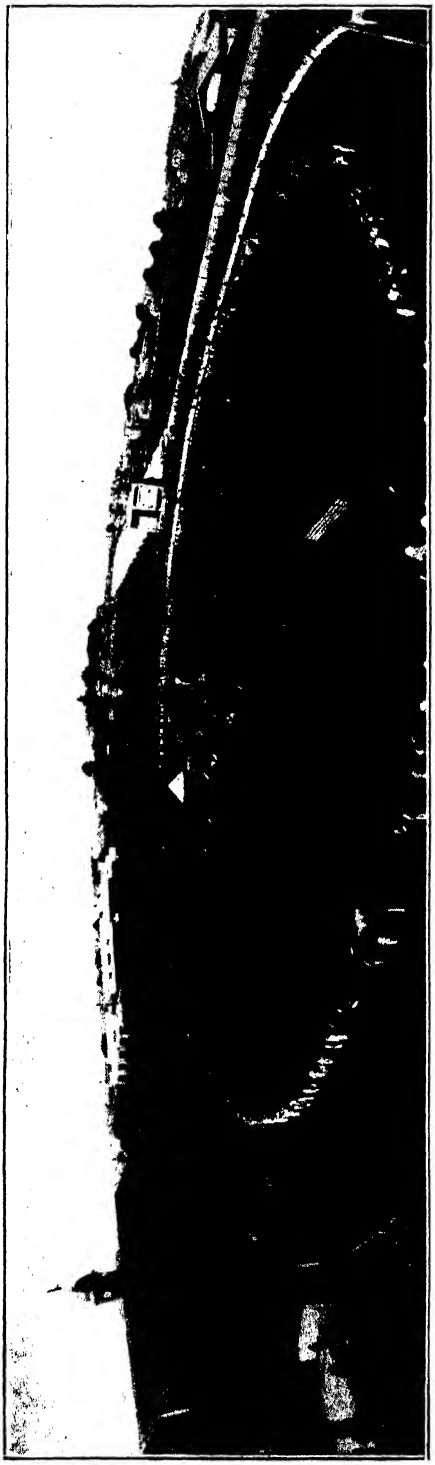


PLATE 57.—ROYAL NATIONAL SHOW, BRISBANE, 1930. A PANORAMA OF THE ARENA.

"The district exhibits and Departmental courts," he added, "together with the displays made by the fruit district representatives, and the general display of agricultural produce, including that splendid exhibit of Warwick wheat, certainly provide our best exhibit in agricultural produce at Bowen Park.

"The dairy cattle show on this ground to-day must stand as the finest cattle show in the world, for there are no fewer than 807 animals stalled, and the competition right through the whole section is particularly keen. The scene at the judging ring when the classes for aged cows in milk were paraded was wonderful evidence of what has been attained in the breeding of high-class stock. The showing in stud beef and fat cattle is more representative than it has been for some years."

In conclusion, Mr. Baynes said the council had been pleased to continue throughout its every section an educative influence. They had planned that the Show should have the brightest possible aspect, and with it should provide a stimulation and reassurance of that confidence which they should all have in such a great country as this. They trusted that, with the closing of the Show, that reassurance would have been accomplished, that the immediate prospects would brighten, and that Queensland would continue onward in her march of progress.

In declaring the Show officially open, His Excellency the Governor-General (Lord Stonehaven) said he thanked the council most warmly for the kind welcome which they had given to Lady Stonehaven and himself. "We are delighted," he added, "to be present with you on a day which is so fittingly set apart as a public holiday. Your Exhibition affords abundant and appropriate cause for rejoicing, and it is a real pleasure to us to share with you in the legitimate pride with which you have referred to the wonderful demonstration of Queensland's natural resources, for which, year by year, for the past fifty-five years, this National Association has afforded an opportunity. For generations past it has been recognised in Great Britain that nothing does more to stimulate progress and efficiency in all branches of agricultural and pastoral industries than the work of associations such as yours; by the prizes offered at annual Exhibitions you provide a most powerful incentive to the raising of standards all round, and the high standards are the only ones worth aspiring to or being satisfied with."

Uuparalleled Possibilities.

"Fortunately, the climate and the soil of Queensland," added His Excellency, "offer a range of possibilities which it would be difficult to find a parallel for in any part of the world, and the numbers and quality of the exhibits are eloquent testimony of the capacity and determination of Queenslanders to develop their splendid birthright.

"The association," continued His Excellency, "was doing great work in another direction. It afforded a legitimate opportunity to the men and women who lived and worked on the land to enjoy a well-earned holiday in the capital of Queensland, and to their fellow-countrymen who dwelt in the city it furnished an opportunity of realising the magnitude and importance of the State's agricultural and pastoral resources. Most important of all, perhaps, the Exhibition brought home to every one a real community of interests which united the well-being and prosperity of town and country. He congratulated them most warmly on the continued and uninterrupted expansion of their successes. It had not been achieved without much hard work, a great deal of it performed gladly as a national service without any pecuniary remuneration. The value of that service to the State could not be exaggerated, and he thought it could fairly be said that the support they received from exhibitors showed how greatly it was appreciated. He would like to congratulate them, too, on the combination of courage, intelligence, industry, and enterprise which could alone have brought the exhibits to the high state of perfection which they saw to-day. To one and all he would like to offer sincerest wishes for their continued happiness and success."

OTHER ADDRESSES

Economic Unity.

In the course of a notable address at the official luncheon, His Excellency the Governor-General, Lord Stonehaven, said: "We all share in the one great birthright over the rest of the world, and that is Imperial citizenship. Because we are sharers of that birthright I look upon myself as a fellow-countryman of yours, just as you have the right to consider yourselves fellow-countrymen of mine, if I should meet you in Edinburgh.

PLATE 58.—AN OFFICIAL GROUP AT THE OPENING.

Included in the gathering are (front row) their Excellencies the Governor-General Lord and Lady Stonehaven; their Excellencies the State Governor, Sir John and Lady Goodwin; the Premier, Hon. A. E. Moore and Mrs. Moore; the Chief Justice, Sir James and Lady Blair; the Lord Mayor of Brisbane, Mr. W. A. Jolly and Mrs. Jolly; the Leader of the Opposition, Hon. W. Forgan Smith and Mrs. Forgan Smith; the President of the Royal National Exhibition, Mr. Ernest Baynes and Mrs. Baynes; the Minister for Agriculture and Stock, Hon. Harry F. Walker; the Minister for Roads and Railways, the Hon Godfrey Morgan; the Minister for Mines, Hon. E. A. Atherton; and the Treasurer, Hon W. H. Barnes and Mrs. Barnes.

"That brings me to a consideration of the need for closer economic unity between the home country and the distant parts of the Empire. In Great Britain we are striving, as you are here, for an ideal high standard of living. To maintain that high standard of living, however, it is necessary that you should live in circumstances which enable you to earn the wherewithal to pay for it. The whole Empire must in the future be regarded as one great Commonwealth. If we considered ourselves as isolated units, and not as members of a great kinship of brotherhoods of people scattered over the world, inevitably the standard of living would depend on the resources of the particular country in which we happen to live. That, however, is too narrow a viewpoint. We have to regard the matter from the standpoint of our over-riding Imperial nationality. The British Empire produces within its boundaries everything in the way of food and raw material that mankind could desire. It is so extensive that it has every variety of climate and every type of production. We of the British Empire have a past made glorious by efforts and achievements such as no other nation can show. It is by a closer union of commercial interests between the United Kingdom and the various parts of the Empire that we can look forward with absolute confidence, not only to the maintenance of the standard of living we have had in the past, but to the raising of that standard. The great need is to stimulate production from every part of the Empire, and to secure the efficient marketing of those products in the Homeland."

Increased Efficiency—Empire Marketing.

"This Exhibition," continued His Excellency, "has provided a wonderful demonstration of the important part that Queensland and Australia can play in that endeavour. The activities of your society provide a marvellous means of educating the people as to the wonderful resources of this State. A visitor to the Show must be very stupid who does not realise that it presents opportunities for learning many things which will be useful to him throughout his life. The fine exhibit in the meat pavilion, and the magnificent show of dairy products in the butter pavilion, are in themselves highly educative. In the butter pavilion is a chart which shows very plainly the wonderful advance that has been made in the dairying industry of this State. It is shown that between 1910 and 1929 the dairy cattle increased in numbers from 365,000 to 740,000, and the output of butter increased from 31,500,000 lb. to 70,750,000 lb., while there has been a proportionate increase in the cheese produced. That shows clearly that by means of increased efficiency in industry we are now obtaining a higher yield per head from our dairy cattle. That is an important indication of progress. I realise that in Australia you cannot consume the total amount of your farm produce, and it is necessary to find markets abroad. In England, on the other hand, we are in a position of having to import a large proportion of the foodstuffs we require. What we want in England is more foodstuffs from inside the Empire, displacing that which is coming in from other countries. I would strongly urge you to develop your meat industry in Queensland, with a view to supplying the needs of Great Britain. Unfortunately, statistics show that the exports of frozen beef and mutton from Australia represent a remarkable shrinkage as compared with the imports from foreign countries.

Community of Interests.

"That brings us to the community of interest on the part of all sections of the British Empire, and the necessity for uniting together to overcome the competition of foreign countries on the home market. I think that your Show does an invaluable work in bringing home to all and sundry the fact that it is only by using our utmost intelligence and by honest hard work that we can attain to the highest efficiency. It is this efficiency in industry and ingenuity in displaying your goods that is required to place your products on the tables of the people in the homeland, who would prefer to be your customers than those of foreigners. The question is how this desideratum is to be attained. Whether it be in peace or war, teamwork is essential to success. It is necessary that we should be as thoroughly organised commercially as politically. If we can transfer to the economic sphere the same activity that we are devoting to the political sphere, it is certain that economic conditions throughout the Empire will be greatly improved. If that teamwork is achieved, you will find that the difficulties with which we are manifestly surrounded at present—in common with all parts of the world—will speedily be overcome.

"Your president has referred to my impending departure. With the improved means of communication existing at the present day, the various parts of the Empire have been brought closely in touch with Great Britain, and I look forward to having an opportunity on some future occasion of visiting your Show. I hope that I will then be one of the crowd of spectators to join in a welcome extended to the King's representative, such as I received to-day.

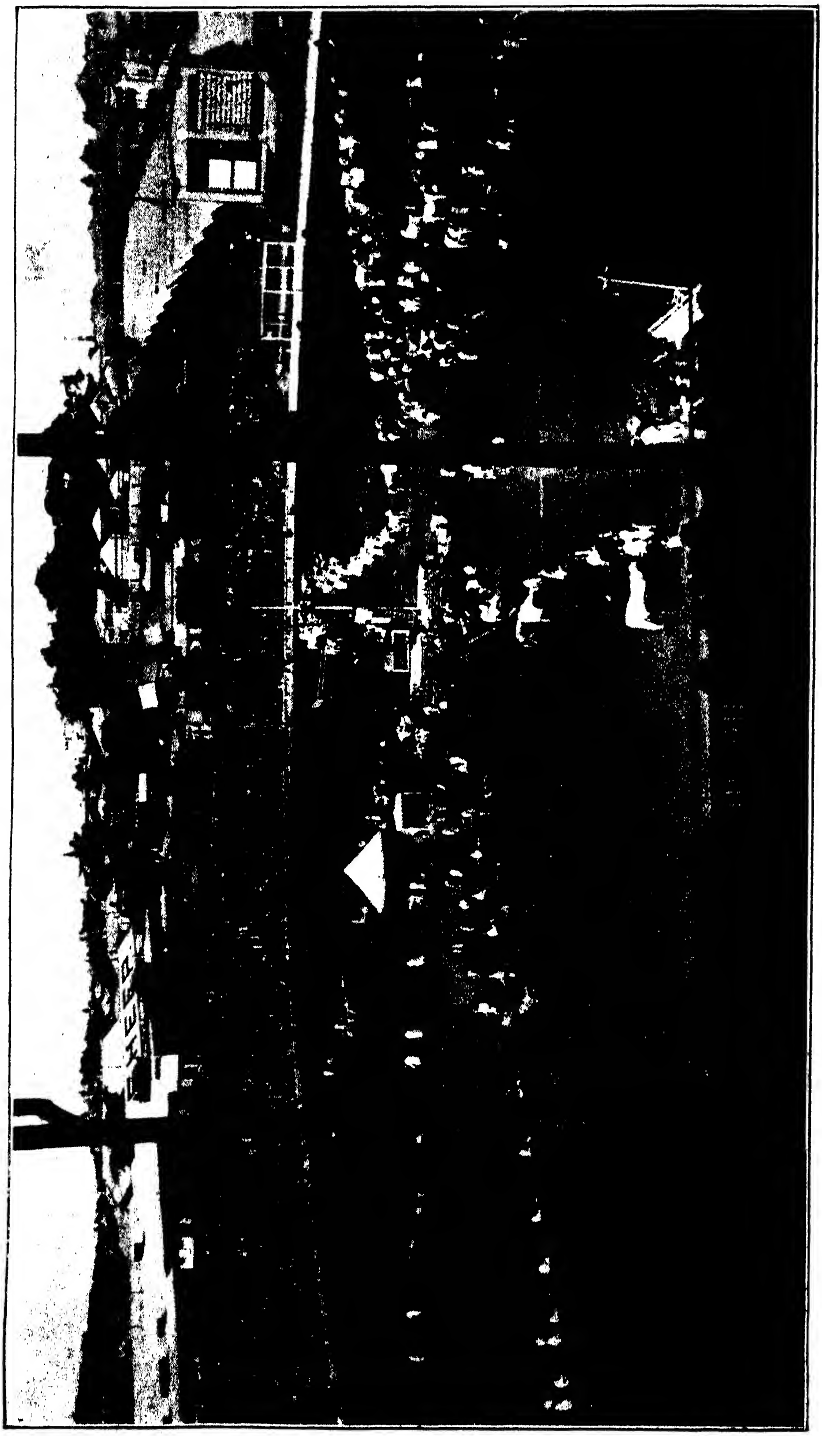


PLATE 59.—A GRANDSTAND VIEW OF THE STOCK PARADE.

No Limit to Expansion.

"As to Queensland, this is a country in which there is no limit to the expansion of which you are capable, and the prosperity you may enjoy. There is no part of the world which is more favoured by Nature, but in order that you may maintain the high standard of living which now exists it is necessary that every man and woman must give of their best. As far as Great Britain is concerned, we welcome your exports of butter and meat, and we will collaborate and co-operate with you as far as we possibly can in marketing your products in the old country. By doing that we will be contributing to the happiness of your people, who, though separated from us by 12,000 miles of sea, are imbued with the same ideals of loyalty as ourselves—loyalty which flourishes as strongly here as in any other part of the British Dominions." (Cheers.)

Speech by the State Governor.

The Vice-president (Mr. P. J. Symes), in proposing the health of His Excellency the Governor, said that both Sir John and Lady Goodwin, by their visits to all parts of Queensland, had contributed much to the happiness of the people. Sir John was essentially an optimist, and in his journeyings throughout the State he radiated a confidence in its future prosperity.

Sir John Goodwin, in reply, said he had spoken many times before of the high value he placed on the work of the Royal National Agricultural Association. One of the most valuable spheres to which it extended its work was that of education. It did one good to see young people watching the judging and judging themselves. It also was a pleasure to see the number of people who came to the Show discussing the exhibits, and thereby gaining a large amount of knowledge which would help to improve methods in the future. There were over 41,000 people at the Exhibition on the previous day, and he had met and conversed with many, and had gathered that they were all learning. It was of immense importance that the people of the cities should know how those of the country earned their living and how they were producing the primary products which were on view at the Exhibition. Were it not for the Show many people would inevitably be in ignorance of conditions which governed the North and West of the State.

One very important lesson was to be learned from the Show—Queensland must be up-to-date and follow modern methods. There could be no standing still. We must always move forward, improving our methods and learning fresh scientific facts. Queensland had to produce the very best, and the very best which the State had produced to date was to be seen at the Show. He was particularly impressed with the dairy cattle, but even that high standard must be not only maintained but raised, so that the country would be able to compete in the markets of the world. He did not think a better meat exhibit could be shown in the world than was on exhibition in Brisbane this year. Individuals must all give of their very best ability in their jobs in order to help the country to place on the world's markets the goods that it was so favoured in being able to produce.

A Vice-Regal Optimist.

"It has been said I am an optimist," continued His Excellency. "Of course I am an optimist. I talk a lot to the children of this State, and learn a good deal from them. A child a little time ago was asked the difference between an optimist and a pessimist. He answered that an optimist was a man who attended to your eyes, and a pessimist one who looked after your feet. (Laughter.) I think that answer is not altogether wrong. An optimist is a man who learns lessons from past experiences and who realises difficulties of the present, and also those which may continue or arise in the future. With a clear vision he looks forward to the future, and does not get depressed; he envisages how his difficulties may be overcome, and he will come out on top in the end. The pessimist's vision does not rise higher than his feet, and he gets depressed at any difficulty and fails to look forward to its surmounting.

"There are two chief reasons why I am an optimist," explained Sir John. "The experience of Queensland which I have had during the past three and a-half years has convinced me that this State can produce the very best; and I believe that Queensland will face all difficulties and emerge triumphant over them all." His Excellency went on to say that a former Governor of an Australian State had told him before he left England that he should avoid two terms—"immense potentialities" and "recuperative capacity." But he could not help observing that Queensland had a power for recovery which was not equalled by any other country in the world.

PLATE 60.—UNDER THE CRITICAL SCRUTINY OF THE RINGSIDE CROWD.

A portion of the Grand Stock Parade of Animals representative of many of the most famous families entered in British and Australian Herd Books.

Advantages of the Show.

The Premier of Queensland (Mr. A. E. Moore) proposed the toast of "The Royal National Agricultural Association." He said that Queensland was extraordinarily fortunate in having such an association. He knew of no organisation which was doing work of a greater value to the State and the Commonwealth. One of its many virtues was that it was pointing out the need in Australia for efficiency and for striving after the very best results. It also conferred an opportunity on the individual to exhibit his industry, efficiency, and enterprise in the best possible way. Queensland had one of the greatest opportunities that had been given to a nation—that of becoming a foremost food-producing country—and the Royal National Agricultural Association of Queensland was standing like a fingerpost, indicating to the people that good enough was not good enough, and that the State must produce only the very best. That was illustrated very well in the Exhibition, where all strove to give something a little better. The association was succeeding in doing that, and its success was a big factor in the progress of the country.

The Chairman of the council of the association (Mr. J. Hiron), in his response, said the association appreciated very much the interest which His Excellency the Governor-General (Lord Stonehaven) and Lady Stonehaven and his Excellency the Governor (Sir John Goodwin) and Lady Goodwin took in the Show and in the society's work. No show would be anything if they did not have exhibitors, and to them a large share of the credit was due.

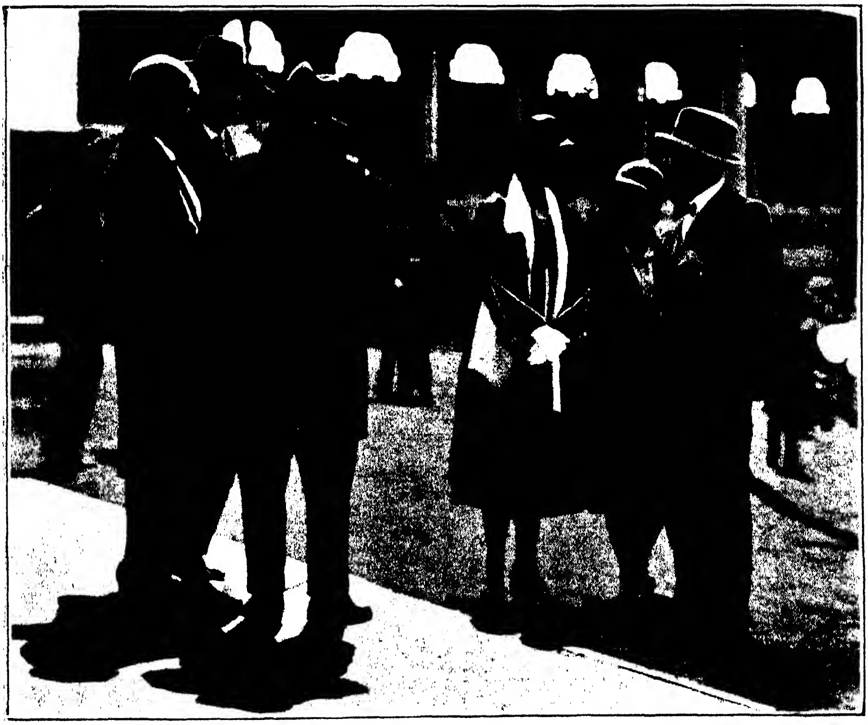


PLATE 61.—THE BRISBANE SHOW BREEDS OPTIMISM.

A cheerful ringside group. Left to right—The Premier, Mr. Moore, and the Rev. Rabbi and Mrs. Levine, Mrs. A. E. Moore, Mrs. Forgan Smith, and the Leader of the Opposition, Mr. Forgan Smith.

PLATE 62.

That the horse is still a factor in successful farming was demonstrated by this parade of Clydesdales at the Brisbane Royal. Notwithstanding the great increase in mechanical transport, the horse is still the more economical power for short hauling and for working the smaller arable areas.

THE COURT OF AGRICULTURE.

REPRESENTATION AND REVIEW OF DEPARTMENTAL ACTIVITIES.

THIS year's display of the Department of Agriculture and Stock was a departure from the models of former years, and a number of new features were introduced, both in the general design and in the case of individual exhibits.

In the lay-out of the Court the key industries of Queensland, wool and sugar, occupied the central position on two wall displays 150 feet in length. In each instance the superstructure of the central trophies took the form of a massive arch supported by pillars of wool and sugar-cane, flanked in the case of the wool with a comprehensive array of cereals. The sugar trophy was supported by dairying and tobacco displays, with two smaller panels illustrating the swine and poultry industries.

Occupying most of the floor space of the Court was a field of cotton ready for harvesting, with a small vine-clad settler's hut in the background. By this arrangement public attention was focussed on cotton, a crop with improving prospects both on the cultural and manufacturing sides.

Entomology and plant pathology were picturesquely panelled. The destructive agencies of plant life, also the highly scientific and technical work necessary to cope with them, were graphically illustrated.

The complexity of modern country life, the attainment of high standards of husbandry, and every phase of rural economics in one phase or another were illustrated effectively in the Departmental Court.

The public was informed by gripping epigram of the vast value of our primary production and the importance of its place in the economy of the Commonwealth.

QUEENSLAND'S WEALTH IN WOOL.

The design of this year's wool exhibit varied considerably from that of previous shows, and was placed in close proximity to the wheat exhibit, the association suggesting that sheep and wheat offer the best possible combination for districts where cultivation is practicable.

The exhibit was arranged with the express purpose of illustrating the activities of the Departmental Sheep and Wool Branch under the control of the Senior Instructor in Sheep and Wool, Mr. James Carew, assisted by Mr. J. L. Hodge. An important part of this work is purely instructional. Sheep farms and holdings in different parts of the State are visited regularly for this purpose, and modern methods of animal husbandry successfully inculcated.

Under the farmers' wool scheme, designed by Mr. W. G. Brown, formerly Instructor in Sheep and Wool, a greater quantity of wool was received for classification this year than previously, which indicates that the small grower appreciates this excellent Departmental service. Out of 108 consignments received, seventy classes were made, each class being distinct. Thus the buyers may know the class of wool they are purchasing, and in consequence the Departmental brand is becoming increasingly popular. This season 108,380 lb. of greasy wool were sold, averaging just under 9d. per lb., a price that emphasises the marked decline in values of recent years.

In order to assist growers in determining the value of their pasture samples of grasses are secured regularly for analysis, and the information so derived is made readily available. The system and its results were well illustrated in the Departmental Court.

Scoured wool was a very attractive feature of the wool display, which consisted throughout of first quality counts and classes.

Manufactured materials, the product of Queensland woollen mills, illustrated the greater possibilities of this side of the industry, as well as the progress in spinning and weaving already made in the State.

The whole range of activity in the pastoral industry from the pasture to either the loom or the freezer was set out very effectively.

PLATE 63.—WOOL EXHIBIT, DEPARTMENTAL COURT.

The wealth of Queensland's pastures and high standards of husbandry were fitly represented in a wonderful Wool Exhibit in the Departmental Court Side panels contained samples of textile fabrics from Queensland Woollen Mills. To-day, this State runs over 20,000,000 sheep, and our annual wool exports are worth round about £10,000,000.

PLATE 64.

A POPULAR VERDICT WAS GIVEN ON THE EVIDENCE—AND THE APPEAL. FLEECES FROM QUEENSLAND FLOCKS.

This fine display of wool was arranged by Mr. W. G. Brown, Sheep and Wool Expert, formerly of the Department of Agriculture and Stock, for the Royal National Association.

QUEENSLAND'S GREAT SUGAR INDUSTRY.

DISPLAY BY THE BUREAU OF SUGAR EXPERIMENT STATIONS.

The varieties of cane exhibited by the Bureau of Sugar Experiment Stations included varieties from Hawaii, Java, India, Mauritius, and Queensland. The Queensland canes included new varieties raised from seed at the Sugar Experiment Station at South Johnstone. Up to the present many thousands of these seedlings have been raised, but many of them, of course, are weeded out in the process of selection. Commercial trials of the best of them are now being undertaken, also experiments as to their disease-resisting qualities. Before any cane varieties are allowed to leave the Experiment Stations they have to pass chemical and commercial trials through plant, first ratoon, and second ratoon crops. Each variety is tested not less than four times in the course of the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and as to whether their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials in the field, so that it may be determined whether such varieties are good croppers. They are further keenly watched for evidence of disease, and no affected canes are allowed to go into distribution. Information of this kind could only otherwise be secured by growers and millers at the cost of much time and money, and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

Full descriptions of the varieties exhibited appeared on the cards attached to the canes, which also give commercial cane sugar content. Many of these canes are at present undergoing chemical and field tests, while others have passed the probationary period and have been distributed to canegrowers. These varieties, however, comprise a very small part of the number of new and tested canes that have been distributed from the Experiment Stations during the past twenty years.

Sugar-cane Propagation.

The Sugar Experiment Station at South Johnstone, near Innisfail, has, during the past seven years, been engaged in raising cane from the seed found in the arrows. This requires the utmost care, as the seed is very minute and has to be most carefully handled. Specially prepared boxes of soil are used, which have previously been sterilised. The cane arrows, when mature, are gently broken off, spread over the soil, watered, and then covered with glass plates. When germination takes place, a large number of minute shoots like grass appear. When these have made further growth they are carefully pricked out into pots or boxes, and are ultimately removed to the field. Several of them which were taken from Badila cane have Badila characteristics, and it is trusted that a cane equal to the Badila will be discovered.

Work of the Sugar Bureau.

The work of this Bureau is divided into four divisions—viz., Soils and Agriculture, Pathology, Entomology, and Sugar-mill Technology—each with a research officer in charge, and a staff of trained assistants. The headquarters of the Bureau is in the Department of Agriculture Building in Brisbane. The recently completed chemistry and pathology laboratories are located here, and these are well equipped and up-to-date. The research activities of the two former divisions are carried out in these laboratories.

Three experiment stations are located in the important sugar areas of the State—one each at South Johnstone, Mackay, and Bundaberg. These are maintained for the purpose of carrying out field experiments on soil treatment, fertilisation, and varietal trials. The stations are also provided with chemical laboratories, equipped for routine, soil, water, and cane analyses.

The Soils and Agricultural Division also controls the extension service. Field officers are suitably located throughout the cane areas, and they keep in close touch with the growers, to advise on any matters pertaining to cultural treatments and pest and disease control. Further, these officers lay out and supervise cultural and varietal trials on chosen farms, so that the exact requirements of individual soil types and climatic conditions may be determined. In the course of the past season nearly seventy such trials were set out.

The Pathology Division has, at present, officers both in the field and in the laboratory, studying the characteristics of and possible control measures for the major cane diseases.

Entomologists are maintained at selected locations so as to be able to deal most effectively with the study and experimental control work of the most important cane pests. The main laboratory is situated at Meringa (near Cairns), so as to serve the far

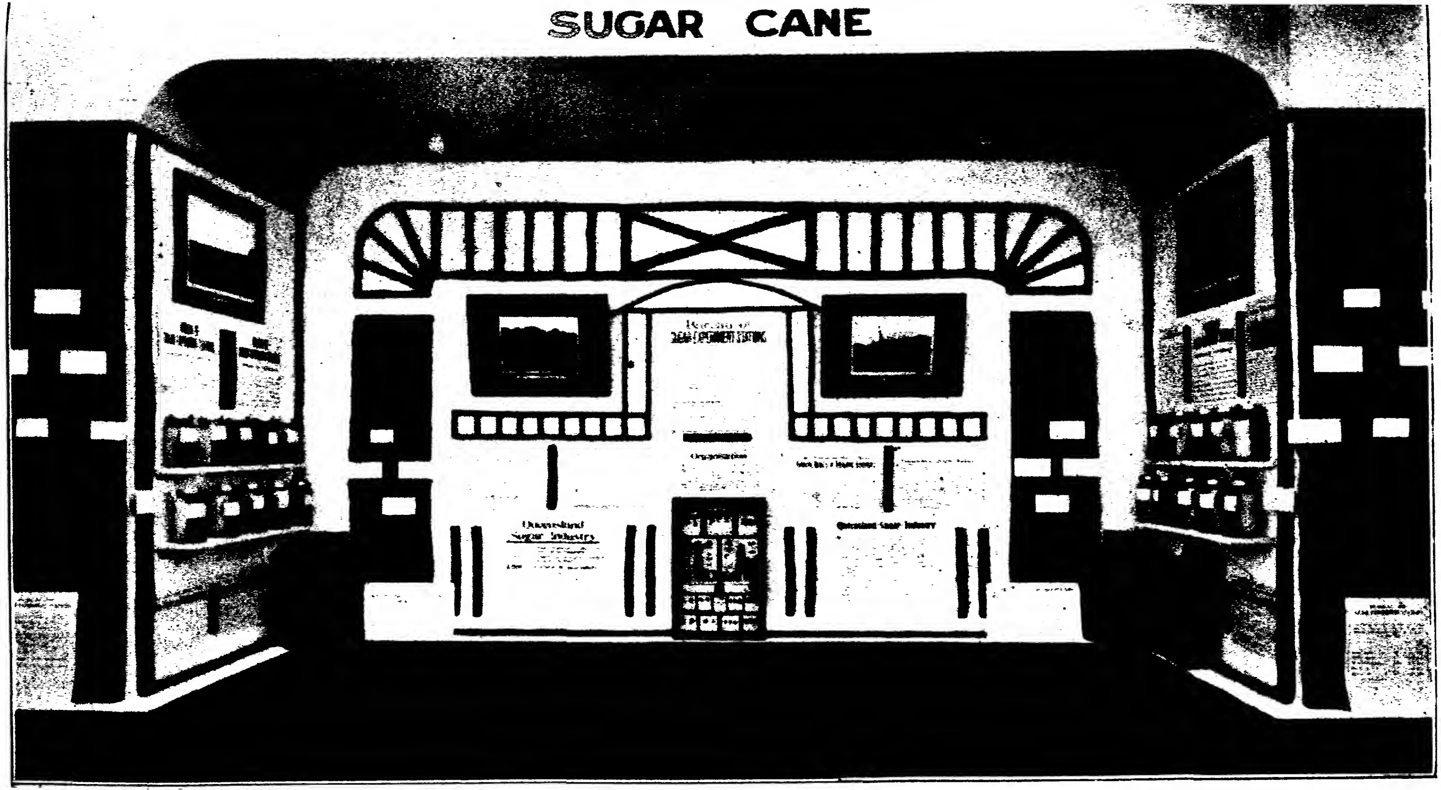


PLATE 65.—A WHITE MAN'S INDUSTRY IN A WHITE MAN'S LAND.

The Cane Alcove in the Court of the Department of Agriculture was a very attractive representation of an industry carried on successfully by White Australian Workers in field and factory, and which is worth well over £10,000,000 a year to the Commonwealth. Sugar growing is this State's leading agricultural enterprise, and in this bay of the Court the farm and laboratory activities of the Bureau of Sugar Experiment Stations were strongly illustrated.

Northern areas, where pest damage is most serious. An entomologist is also located at each of the experiment stations of Mackay and Bundaberg.

The division of Sugar-mill Technology was recently initiated, and is now in the process of organisation. With a well-equipped laboratory at Mackay, the technologist and his staff will investigate the problems pertaining to the various phases of sugar extraction and manufacture.

In all, there are twenty-three officers on the Bureau staff, and the organisation covers the several phases of cane production and manufacture in a manner quite unique amongst the primary industries of Australia. The funds for the maintenance of the Bureau are contributed equally by the industry and the Government.

Economic Value of Cane Cultivation—Its National Significance.

The work of the Sugar Experiment Stations, in relation to the promotion of the agricultural welfare of Queensland in connection with the sugar industry, cannot be over-estimated. When it is considered that this industry is the greatest agricultural one in Queensland, and will produce over 500,000 tons of sugar this year, estimated to be of the value of about £10,000,000, it can be seen how highly necessary it is that it should be assisted and encouraged in every possible way. Apart from its economic value, however, it has a deep national significance, and has already played a very large part in peopling the North.

Rainfall.

The Queensland rainfall, fortunately, is highest during the summer period, at which time the cane plant makes its maximum of growth. The following are average rainfalls in the principal sugar-growing districts:—Cairns, 92.65; Johnstone River, 160.88; Herbert River, 84.91; Mackay, 66.67; Bundaberg, 44.40. Cane grows best when the relative humidity of the atmosphere is high, and this is the case during the wet season in Northern Queensland.

Production and Prospects.

Queensland's sugar production in 1867 was 338 tons, and in 1928 reached 520,000 tons, the record crop to date.

The yield of cane and sugar per acre is improving, due to better methods of cultivation and growth of superior canes. The mills have also largely increased their efficiency, and over £2,000,000 have been spent during the past five years in improving existing mills, while, in addition, the Queensland Government have the most up-to-date sugar plant in Australia in the Tully River district.

Queensland is by far the largest sugar producer in the Commonwealth, manufacturing about 96 per cent. of the total output. The sugar-fields stretch along the north-eastern coast of Australia (with some intervals of poor land with deficient rainfall), from the border of New South Wales to Mossman in the Cape York Peninsula. The total acreage under cane is now about 290,000. It is, therefore, the largest agricultural industry in Queensland.

To deal with the cane supplied from this acreage there are thirty-five sugar-mills in operation. Each mill has a system of 2-feet tramways radiating to the surrounding farms for the transport of cane to the mill, while all the mills are connected by rail to the nearest seaport, the manufactured raw sugar being shipped away to the refineries at Bundaberg, Brisbane, Sydney, Melbourne, Adelaide, and Perth.

Progress in the North.

One of the most marked features of the sugar industry in recent years has been the great progress made by the sugar districts north of Townsville. In 1910 the sugar-mills beyond Townsville produced 57,135 tons of sugar, while in 1928 the production in this area reached 255,188 tons from ten mills, while the twenty-five mills south of Townsville produced only 265,432 tons. This has been due to the opening up of fine sugar lands in the rich rain-forests of Babinda, South Johnstone, and Tully, and the development of the older lands at Cairns and Ingham, by providing more capacity at the existing sugar-mills.

The opinion held by medical men is that the white man can lead a healthy life and rear a vigorous family in tropical Queensland.

The Cane Alcove in the Court of Agriculture contained information and illustrations relating to the whole sugar industry from the first cultural operation to the last refining process.

DAIRYING.

The Dairy Exhibit was a comprehensive one with a strikingly original arrangement. Milks, cream, granulated butter, and butter were exhibited; also cheese in its various stages of manufacture. By-products, such as casein, dessicated milk, milk powder, were also strongly in evidence. Herd testing in all its detail and bacteriology as it applies to dairying was given prominence.

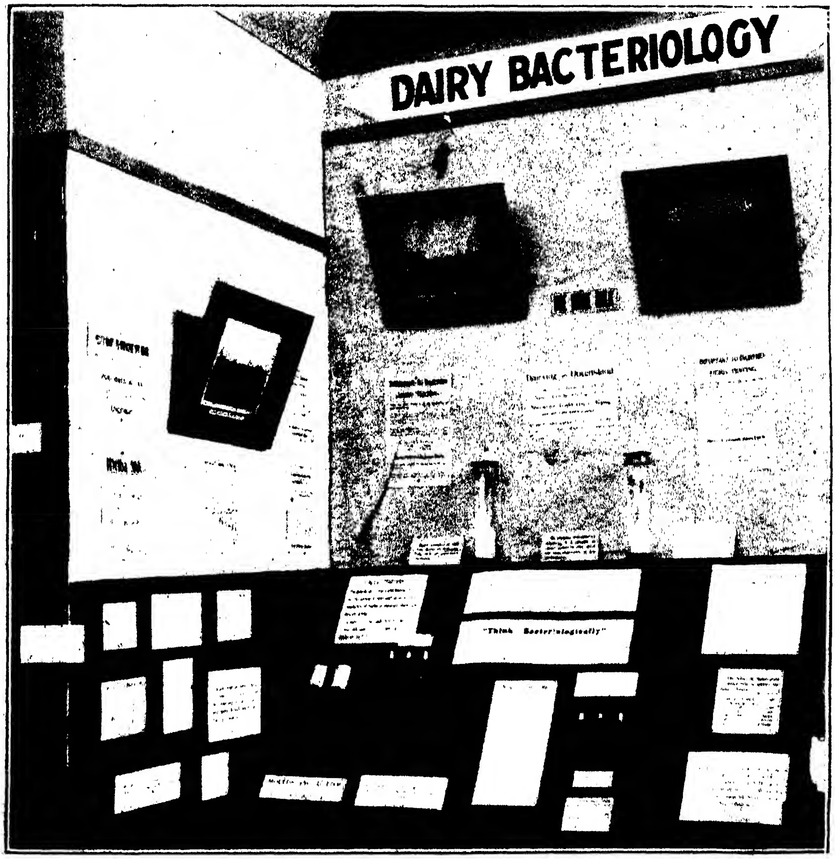


PLATE 66.—MILK AND MICROBES.

That there should be no synonymity in this term was demonstrated most effectively in this corner of the Court. The necessity of scrupulous cleanliness in the milking-shed and dairy was impressively illustrated.

The central idea of the display was based on the food value of milk. An imitation bottle, 6 feet high, set out with an appropriate background, formed the centre of the trophy, around which pasteurised milk, in bottles of varying sizes, were placed in such a way as to emphasise strongly this method of milk delivery.

A number of slogans urging the value of milk and its products completed a very fine display that won popular commendation.

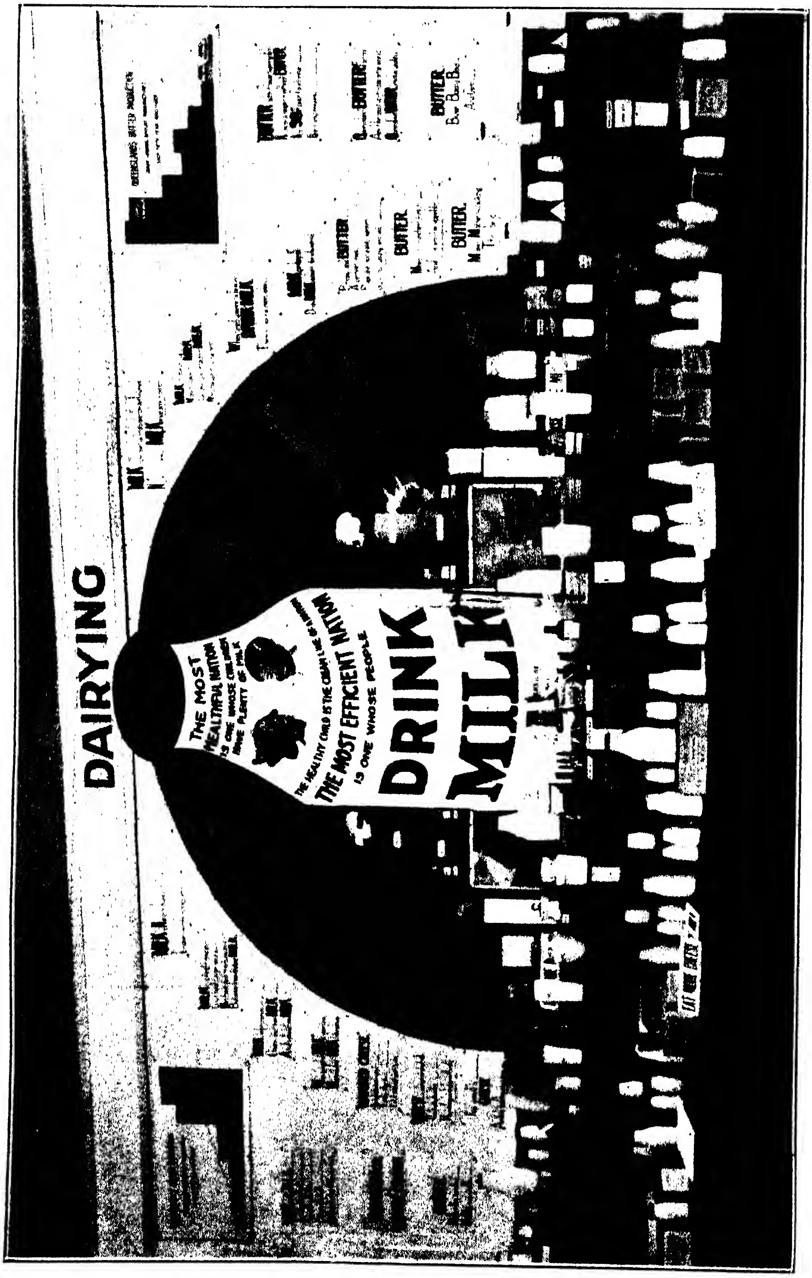


PLATE 67.—MILK FOR THE MULTITUDE.

Dairying is a great and rapidly expanding industry in Queensland, one fourth of the total Butter output of the Commonwealth and almost half of the Cheese out-turn are produced from Queensland's pastures. Its annual value is approximately £7,000,000.

POULTRY RAISING.

The exhibit of the Poultry Branch, as in previous years, was of outstanding interest. A feature of the display was the variety of poultry farm requisites, and in designing these consideration was given to simple and cheap methods of construction and maintenance of efficiency. In keeping with the present over-production of eggs in comparison to local consumption the trap nest was shown, illustrating that by its use the poultry farmer is able to produce eggs at a much lower cost. The demands of the industry at present are that eggs must be produced cheaper, and by the installation

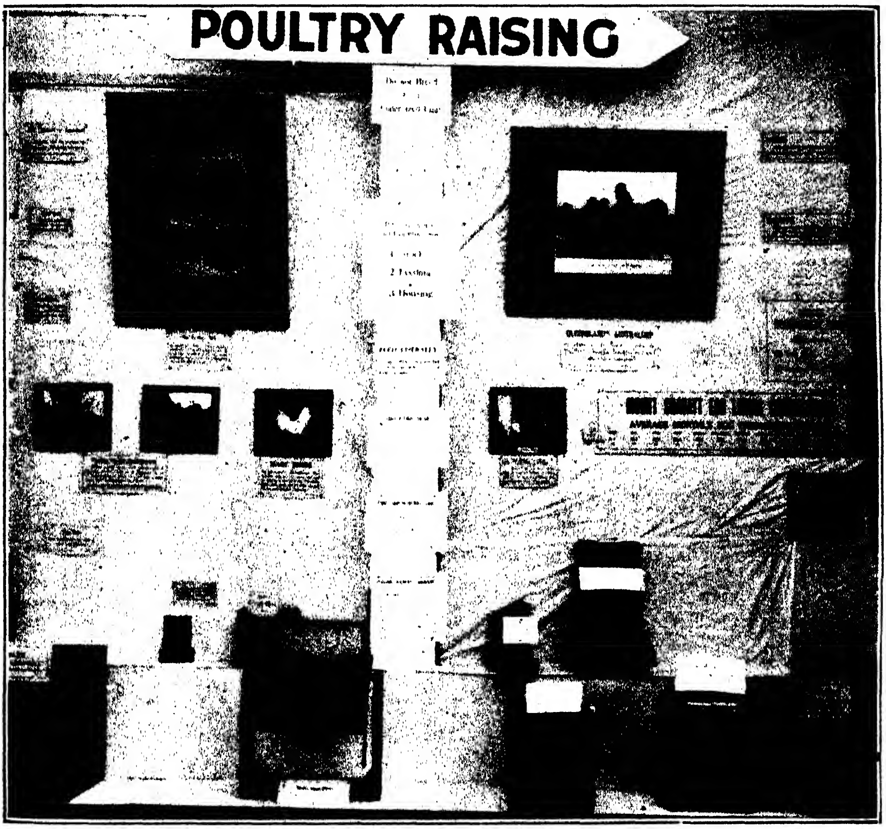


Plate 68.—The Poultry Panel in the Agricultural Court.

This display illustrated the educational work of Departmental officers in a rapidly expanding and valuable Queensland industry returning nearly £1,000,000 annually to the State.

of the trap nest the poultry farmer is able to locate non-layers, and these can be culled, thereby increasing the average egg yield in relation to the quantity of food consumed. The trap nest is also an aid to flock improvement, for by its use the best layers can be selected for breeding purposes.

Numerous practical examples of breeding, feeding, housing, and other phases of poultry raising were displayed. These were really pointers to success in poultry keeping.

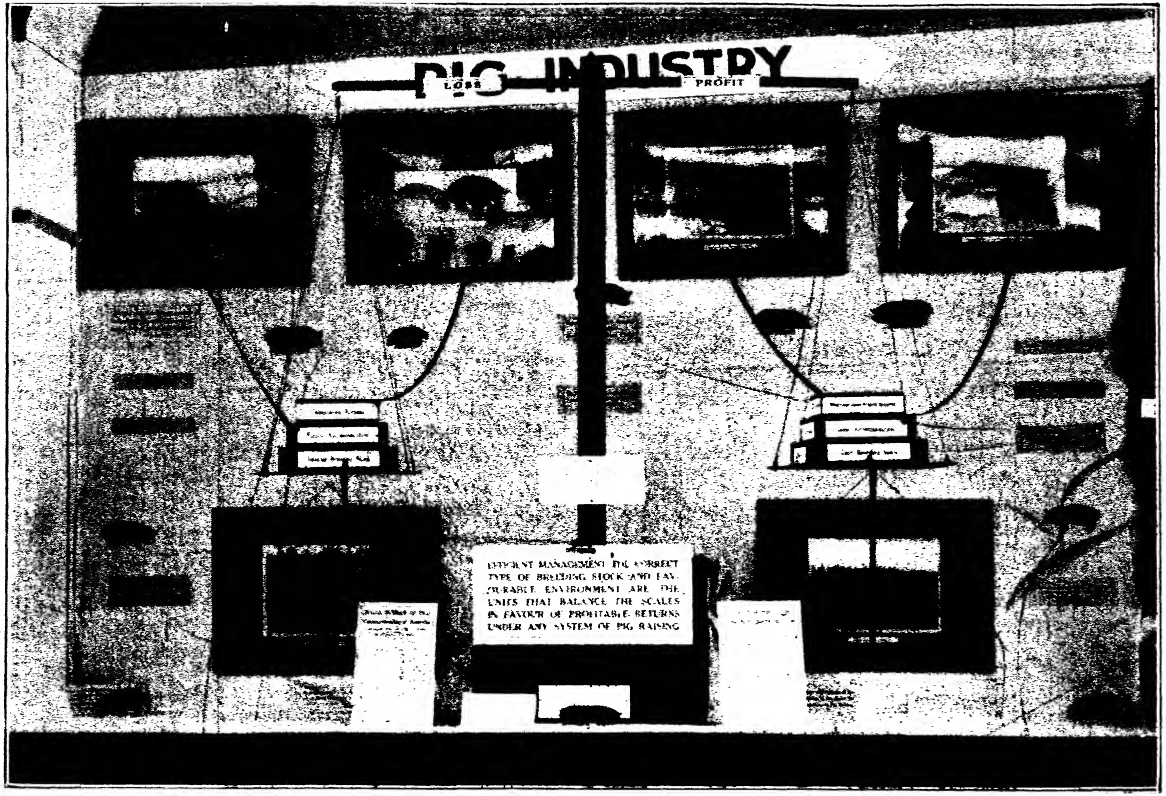


PLATE 69.—A BALANCED INDUSTRY. PIG EXHIBIT. DEPARTMENTAL COURT.

Pig raising in Queensland is rising rapidly in importance as a staple industry. Throughout the year an active educational campaign is carried on by the Department of Agriculture and Stock, and this panel illustrated the nature and value of that work.

PIG RAISING.

The pig-raising activities of the Department were strongly illustrated by trophy and illuminating legend.

A gigantic set of scales, balancing profits and losses and the factors governing both, made up the central feature; thus good breeding, feeding, careful management, suitable environment, and judicious control were weighed against neglect, improper breeding, faulty feeding, and unhealthy surroundings.

At the Pig Section buildings, the display of a miniature model farm piggery was a special feature. This had been prepared with the object of providing fresh ideas for the practical layout of accommodation for the pigs. Pig raising is essentially a farm foods feeding proposition, hence the production and utilisation on the farm of the necessary food supplies must be the principal aim of the farmer. This necessitates the provision of cultivation paddocks, grazing areas, and suitable and sufficient paddock accommodation to enable the pigs to be kept in the open air as much as is possible in preference to being continuously housed.

This model of a farm piggery provided not only for cropping areas and for succulent pasture, but also for a satisfactory type of shelter-shed, portable or otherwise, such as is adapted for use in the open-air system of pig raising. Provision was also made for concrete feeding floors and troughs, oiling posts, movable hurdles, netting fences, and drafting yards. The fences, gates, and hurdles were of a type suggested as suitable for the pig farm.

Various cuts of bacon in normal and abnormal condition were displayed with the object of stressing the loss associated with the improper handling of pigs in the fattening and marketing stages. The industry suffers appreciable losses each year through the supply of pigs in an overfat condition and through bruising and damage of carcases in transit.

In the Pig Section were representative animals of the following breeds:—Berkshire, Middle Yorkshire, Tamworth, Poland-China, Gloucester Old Spot, Duroc Jersey, Large Black, Chester White, pork and bacon pigs. There were also exhibits in the litter weight classes and a display of pigs from the Pig Breeding Experiments at the Gatton College. The pigs were housed under modern conditions.

CEREAL CROPS.

It was a happy idea having the Sheep and Wool, Dairying, Pig Raising, and the Poultry exhibits in proximity to those of Wheat, Barley, Oats, and Maize in the Departmental Court. This arrangement served to emphasise the interdependence in quite a number of ways of these several important industries. The function of a Department of Agriculture, however, is to demonstrate how production may be increased, and the quality of individual products not only improved but maintained.

An examination of the work of officers of the Department through the medium of the exhibits showed that they have tackled their problems in the only way that a scientist can approach them—i.e., by getting down to fundamentals. One striking point in this display was the improvement manifest in the type and quality of grain wrought by the individual breeders of wheat and maize. This branch of research calls in the first place for a natural aptitude and love for such work and, secondly, for vision in respect to its accomplishment. Both attributes were abundantly obvious. Interesting information of various kinds was given regarding each individual industry.

Special attention was bestowed on plant breeding, seed selection, and the production of seed for distribution, to the description and treatment of plant diseases, and to the principles of cultivation and to experiments with fertilisers. Particulars are summarised of a series of fertiliser tests with wheat carried out over a term of fifteen years at the Roma State Farm were set out, and it was of interest to note that up to the present the manuring of the crop on this particular farm has not proved an economic proposition. The inference may be drawn that the conservation of soil moisture and approved methods of cultivation exercise a more direct bearing on yield than that of artificial fertilisers.

Similar remarks may be applied to the fertiliser experiments with maize on the red volcanic soils at Kingaroy, as the results of two seasons' work, were clearly shown on charts exhibited. In the 1928-29 series there were 144 plots, these being protected by buffer areas. Seventy-two plots were fertilised, and there were seventy-two unfertilised plot controls. Each fertilisd plot was surrounded with controls.

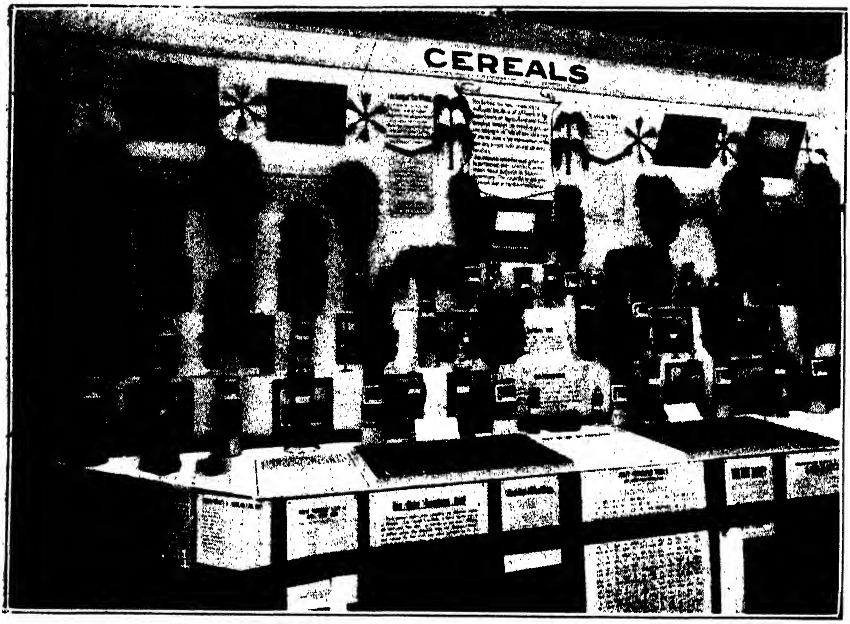


PLATE 70.—THE STORY OF THE OPEN DOWNS IN SHEAF, GRAIN, AND VALUABLE DERIVATIVES.

PLATE 71—CEREAL DISPLAY, DEPARTMENTAL COURT.

These two panels told an impressive "Cereal Story" of the progress and development of the great grain lands of Queensland. They demonstrated the success of Departmental Wheat and Maize breeders in the evolution and fixation of varieties and types that have quadrupled our grain yield. The examples shown were bred at the Roma State Farm and grown in different parts of the Darling Downs.

There were six mixtures of fertilisers, and each test was replicated twelve times. The results were negative in character, and there was little or no difference between the yields of the fertilised and unfertilised plots, details of which are as follows:—

Total weight of ears from seventy-two control plots (1.44 acres) = 5,937 lb. = 60.37 bushels per acre.

Total weight of ears from seventy-two fertilised plots (1.44 acres) = 5,987 lb. = 60.87 bushels per acre.

In the 1929-30 series there were 132 fertilised and twelve control plots surrounded as before by a buffer area. Eleven mixtures were used, and each was replicated twelve times, the plots being randomised.

These plots were only recently harvested. Final details have not yet been worked out according to the students' method of calculation.

Taking a bare comparison, however, which is not to be regarded as final, this determination shows the approximate yield to be as follows:—

Total weight of ears from twelve control plots = 357½ lb. = 42.5 bushels per acre.

Total weight of ears from 132 fertilised plots = 4,144 lb. = 44.8 bushels per acre.

Highest average yield was obtained from PsK mixture (twelve replications)—viz., 47.3 bushels per acre.

Average yield from controls (twelve unfertilised) = 42.5 bushels per acre.

Cost of fertiliser (PsK mixture), £1 5s. 10d. per acre.

A small exhibit was staged of the Giant Morocco variety of canary seed, which was propagated by the Department for the express purpose of distributing improved seed to growers. The importation of canary seed to the Commonwealth has now ceased. A pool was formed last year to permit of the product being marketed on a co-operative basis, and a strong effort is being made to grow sufficient canary seed on the Darling Downs to meet Commonwealth requirements.

ENTOMOLOGY.

The work of the Division of Entomology and Plant Pathology was again represented by an extensive display dealing with the more important insect pests and diseases affecting Queensland crops.

The exhibit staged by the Entomological Branch of this Division consisted mainly of a series of life-history cases demonstrating by means of coloured drawings and actual specimens the history and habits of the insects causing serious loss in fruit, vegetables, grain, and other crops. There were also cases dealing with stock pests, such as the blow fly and the cattle poisoning saw fly, which was of special interest to the pastoralist.

Of exhibits of more special interest at the present there were specimens of the banana insect pests, including the banana weevil borer, the banana thrips, the spotting bug, and the fruit-eating caterpillar. Citrus pests were dealt with in one large case supplemented by a separate presentation of the spiny orange bug. A number of vegetable pests, including the cabbage moths, bean fly, potato tuber moth, and the corn ear worm of tomatoes, were displayed in an interesting way. Of special interest to most Queenslanders was a case presenting a study of the prickly-pear destroyer, *Cactoblastis cactorum*. The water-colour drawings, which formed a conspicuous feature of this display, were the work of Messrs. I. W. Helmsing, E. Jarvis, and H. Jarvis.

Plant Pathology dealing with the fungus and bacterial diseases of crops was represented by a series of preserved plant specimens, illustrating most of the commoner diseases of fruit, vegetables, and cereals. Jar specimens were supplemented by coloured illustrations of the various maladies. The several diseases of the banana, citrus, pineapples, and tomatoes were dealt with in particular detail. Bunchy top of the banana was well represented by means of a living affected plant and by photographs. Among other well-known diseases displayed were black spot and melanose of citrus, Irish blight of the tomato and potato, water blister of pineapples, and the common wheat smuts.

The Entomological display was arranged by Mr. J. A. Weddell, while the Plant Pathology section was in the hands of Messrs. R. B. Morwood and L. F. Mandelson under the supervision of Mr. J. H. Simmonds, Plant Pathologist.

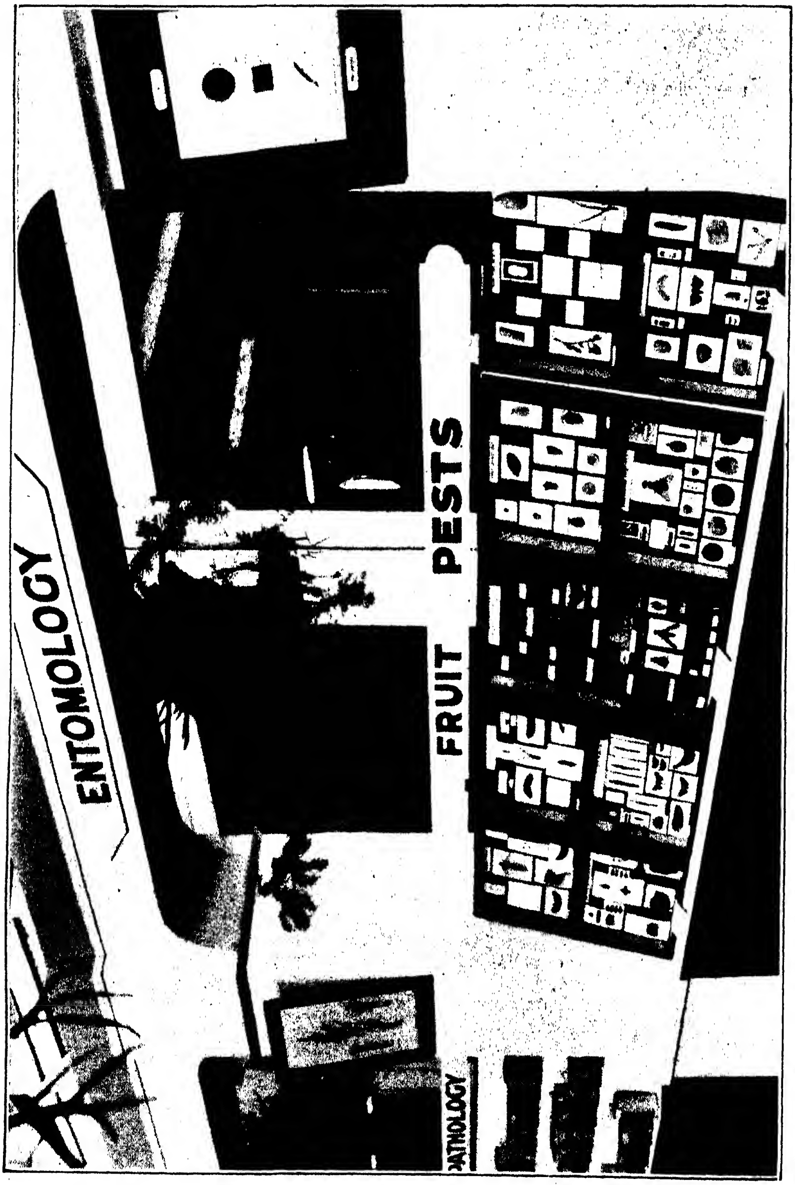


PLATE 72.—FRUIT PESTS EXHIBIT. DEPARTMENTAL COURT.

This and associated annexes in the Departmental Court illustrated the investigations of the Scientists who, in Queensland, work in double harness with the primary producer.

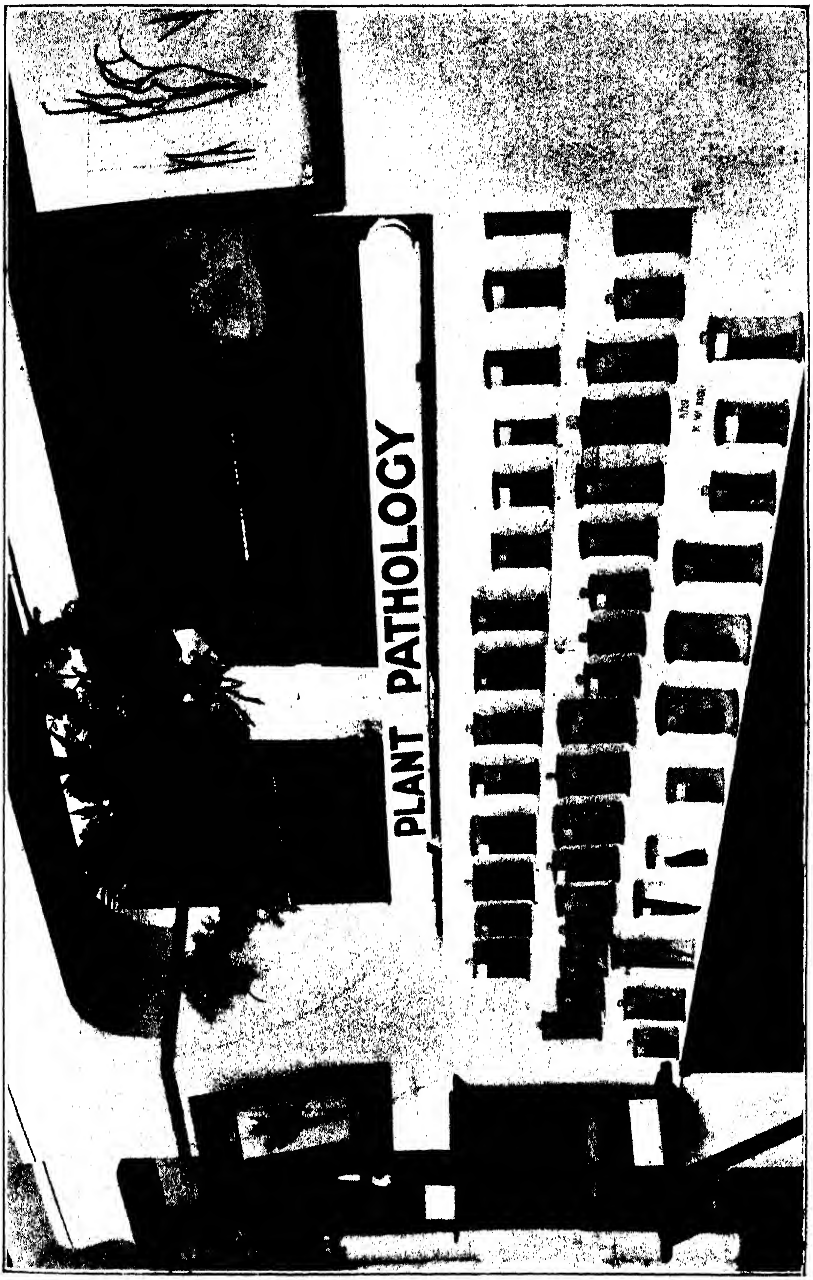


PLATE 73.

A PANEL IN THE DEPARTMENTAL COURT, ILLUSTRATING THE SERVICE OF SCIENCE TO THE FARMER.

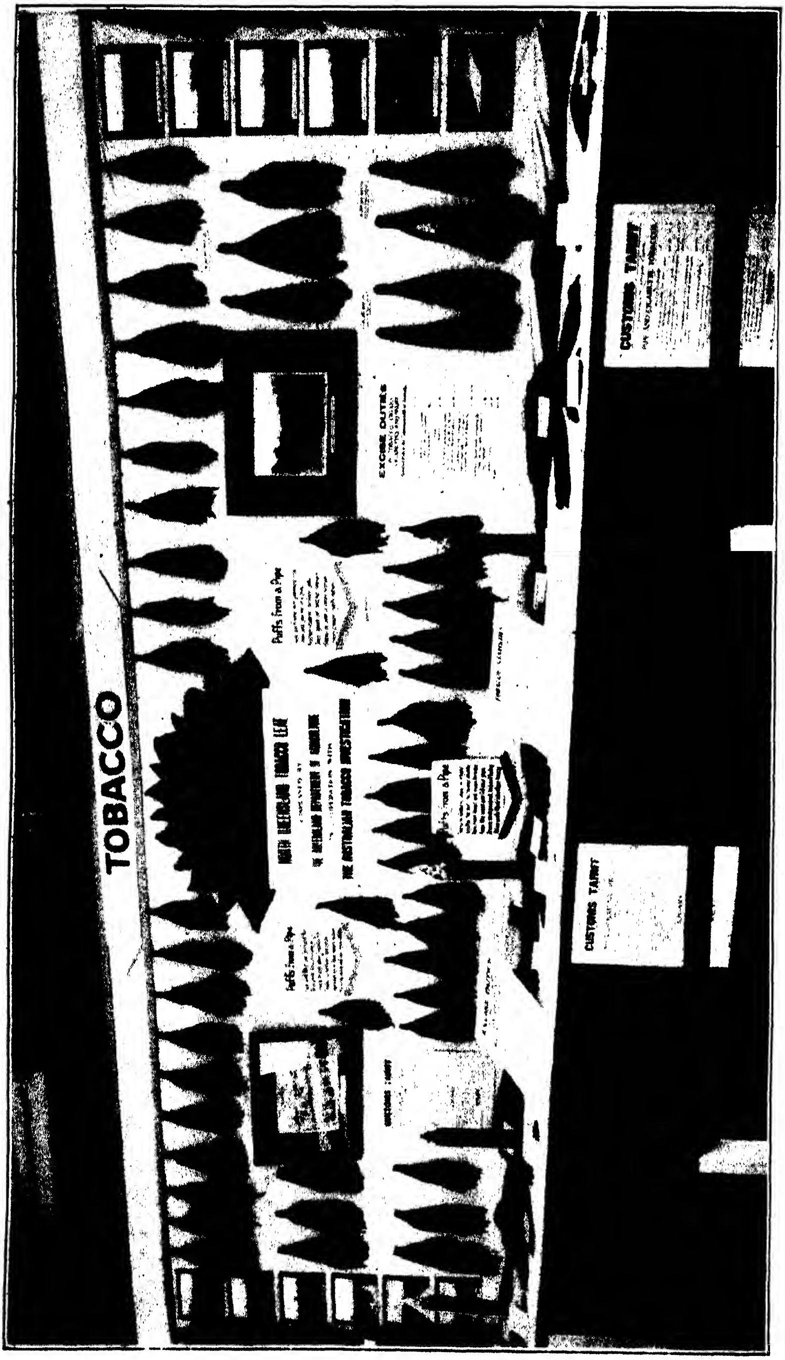


PLATE 74.—QUEENSLAND-GROWN TOBACCO.

This panel in the Departmental Court illustrated the revival in tobacco growing in this State. Leaf produced in North Queensland was recently described in evidence before the Federal Parliamentary Select Committee on Tobacco growing as the best yet produced in the Commonwealth.

TOBACCO.

In view of the increasing interest manifested in Australian tobacco production, the exhibit of tobacco leaf produced in several districts of North Queensland, displayed by the Queensland Department of Agriculture in co-operation with the Australian Tobacco Investigation, attracted a large measure of attention.

Tobacco leaf produced in North Queensland was recently described in evidence given before the Federal Parliamentary Select Committee on Tobacco Growing as the best yet produced in the Commonwealth, while the statement was also made that it was considered possible to obtain from crops grown on certain types of North Queensland soils upwards of 90 per cent. of bright-coloured leaf when flue-cured.

The satisfactory prices, ranging up to 3s. 8d. per lb. according to grade, from the manufacturers for commercial lots of leaf produced in the Townsville, Charters Towers, and Pentland districts, respectively, last year, together with the indication from the purchasers that further lots of similar and better quality would be readily purchased, suggest, especially in view of the increased duty on imported leaf now operating, that tobacco leaf production on suitable soils in North Queensland will prove extremely profitable, and in the near future become an industry of great importance.

The exhibit comprised examples of flue-cured bright tobacco leaf produced in the Mareeba, Ingham, Townsville, Pentland, Bowen, and Mackay districts, respectively, and also examples of air-cured leaf of the White Burley variety produced in the Townsville district.

While bright tobacco varieties are grown on light-textured soils of low fertility, to which fertiliser is added in quantity sufficient to secure moderate leaf development and flue-cured, the White Burley variety is grown on rich soil in order to secure large leaf development, and is air or fire cured. The former is appreciated for mild cigarette and pipe tobacco, while the latter is valued for pipe smoking or for blending in pipe and cigarette mixtures.

Grades of leaf of both flue and air cured types were shown with cards denoting their respective uses in manufacture.

Enlarged photographs depicting crops of tobacco, transplanting young plants, harvesting ripe leaf and other features of production, served to enhance the attractiveness of the display, while tables of statistics relating to Australian manufacture, importations and Customs duties indicated the importance of the industry and the extent of its possible development.

COTTON.

The cotton exhibit this year was arrnaged so as to afford a slight idea of how a field of cotton in full maturity appears. In conjunction with this fine central feature, illustrations explaining the methods adopted by the Departmental officers in the breeding work connected with developing varieties of cotton suitable for Queensland conditions were displayed.

Examples of the standards for grades of seed and lint cotton which are used in valuing the growers' crops when they arrive at the ginnery and prior to the sale of the bales of lint were also on view.

A comprehensive range of by-products obtained from the cotton seed was also presented so as to illustrate more fully the economic value of the crop to Australia generally. Fuller information on this and other phases of the cotton industry accompanied the various sections of the exhibit.

PLATE 75.—COTTON WAS KING.

A field of cotton surrounding a new selector's home was the central feature this year in the Court of the Department of Agriculture and Stock. This year Queensland will pick about 10,000 bales, and the industry is as yet in its rudimentary stage. Projected spinneries will provide a home market for Queensland's "white hope."

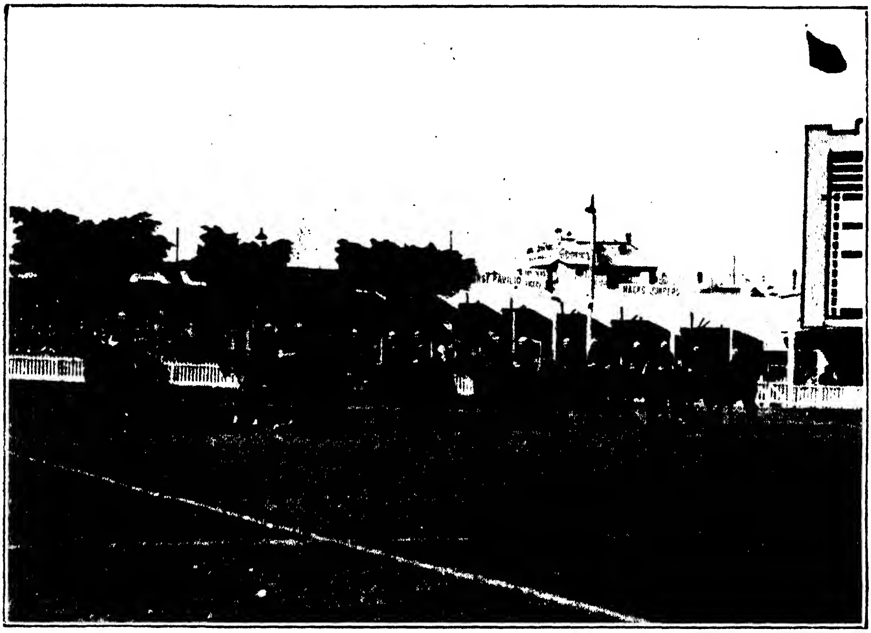


PLATE 76.—THE VICE-REGAL ESCORT. TROOP OF QUEENSLAND MOUNTED POLICE.

The Queensland Mounted Police is composed of expert horsemen, and is noted for its very high standard of efficiency. The horses were bred at Rewan, the Government Remount Station in Central Queensland.

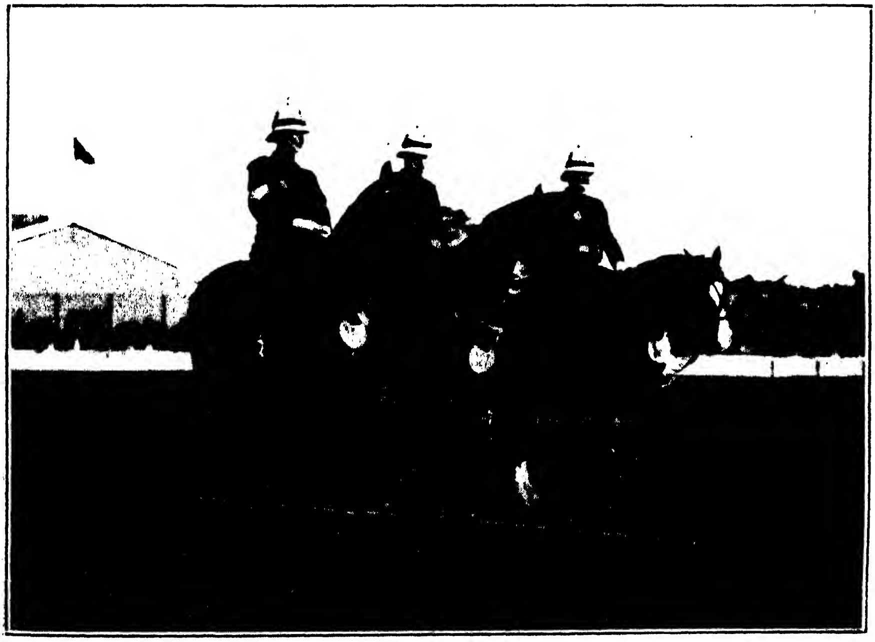


PLATE 77.

Queensland Police Horses, representatives of the famous "Waler" type, so popular as cavalry charges in Imperial and Dominion Armies.

DAIRY CATTLE AT THE SHOW.

EVERY year adds to the number of entries representing a splendid class of dairy stock, bred by careful breeders, who, from year to year, have added to the great wealth of the State. There is no doubt that the breeders have not only risen to the importance of producing first-class animals, but have focussed their attention on obtaining tip-top sires, a reflex of careful culling. The long term of winter rains, no doubt, robbed many of the stock of their bloom, and this was frequently commented upon by keen observers. There was, however, a remarkable assemblage of high-class dairy stock, and the judges in all the leading classes had a most difficult task. Hundreds of well-known breeders were present from the sister States, and, with well-known Queensland breeders, expressed the view that to witnss such an array of high class stock was a show in itself, and, as many said, an eye-opener.

AUSTRALIAN ILLAWARRA SHORTHORNS.

Of all the breeds, the Australian Illawarra Shorthorn is the one that arouses general admiration, and at several periods of the judging the encroachment of the huge and critical crowd became so great that the stewards had to clear the "decks," and give more room to the judges. The Royal Association might, with advantage to the public, who are ever eager to learn results quickly, appoint two judges for the Illawarras and Jerseys—two classes which have gained great popularity in Queensland, both in number and quality. The judge of the Illawarras, Mr. Jos. Wills, of Kangaloon (New South Wales), took the precaution of having his son, who was present, to assist him in determining the awards. He had a huge task, and his opinion, as a well-known breeder, was one of praise for the class presented.

Cows and Heifers.

As in former years, judging of the cow, 5 years old or over, in milk, proved to be a difficult task. The reds predominated. The choice fell on Mr. J. Phillips's Myrtle IV. of Lemon Grove, and this rich red subsequently annexed the championship. Mr. A. Pickel's Jean VI. of Blacklands, also a deep red, came a good second. The section cow judging, 4 years old and under 5 years, proved to be a tedious job, and a stylish red, owned by Mr. A. T. Waters, Fussy V. of Railway View, secured the blue, while a close runner-up was Mr. J. Phillips's Evelyn of Sunny View.

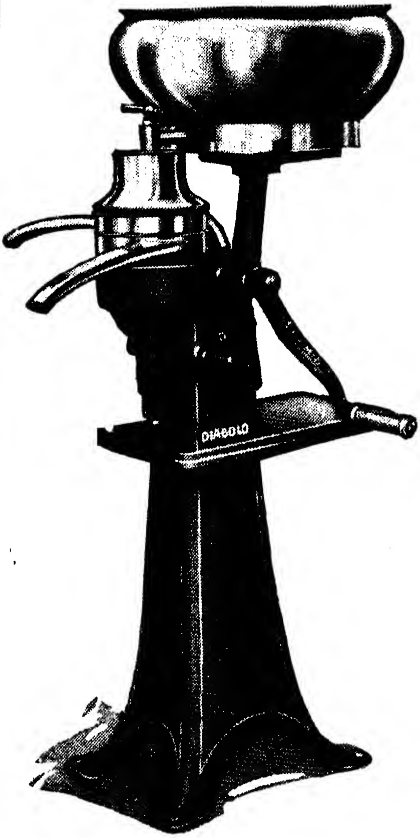
In the younger set of females, however, an even keener contest was staged, and the class for a heifer, 2 years old and under 3 years, in milk, produced a splendid collection of stock. The beast to attract most attention was Mr. Pickel's Stella of Blacklands, a handsome little red, with great possibilities. In the class, heifer, 2 years old and under 3 years old, dry, there was an even contest, finality resting with Messrs. Hickey and Sons' Happy IV. of Springdale.

There was a very large entry of heifers, 18 months old and under 2 years, dry. Mr. Pickel's Foremost III. of Blacklands was well in the running, and this little aristocrat annexed first place, with Grace IV. of Greenfields second. In the heifer calf class the judge seemed to be perplexed as to where to do justice. The younger generation of show cattle often prove to be future champions, and it was evident that Dnalwon Lucky Star had a good chance, and after a searching examination secured the coveted ribbon. There was keen rivalry for second and third positions. Jean VIII. of Blacklands being placed second, with Kitty of Sunnyview third.

Of the aged cows, the champion cow, Mr. J. Phillips's Myrtle IV. of Lemon Grove, was a rich red, with a wonderful constitution, and great breeding. The heritage of this cow is a wonderful asset to the owner, and there was unstinted praise for this beautiful beast when she captured the championship sash. The reserve champion, Mr. A. Pickel's Queen VI. of Blacklands, was a beast of wonderfully true Illawarra type, and the contest was an animated one.

The Bulls.

There is no show in the Commonwealth to-day, and one might safely say in any part of the world, which can stage bulls of the class of Illawarras as were presented at Brisbane this year. The aged bulls, particularly, showed great breeding, with


DIABOLO

fully 60 per cent. of them true Illawarra type. There were, however, quite a number presented of a rough and uncouth appearance. The aged bulls were mostly in good condition. The champion, Mr. F. O. Hayter's Daphne's Royal of Hill View, was, in every way, a fine and well-proportioned beast, with a big length and well-formed limbs. His colour denoted the origin of a dash of the Ayrshire, for he showed white spots along his flanks and sides. The reserve champion, Limelight of Gulvallis, was a rich red, and this beast has great possibilities.

The "bloom" of the older bulls was a contrast to the younger generation, and an enormous crowd witnessed the examination of the bull, 4 years old or over. In the class of bull, 3 years old and under 4 years, there was very keen competition, and it was evident that Jellicoe of Headlands had a great chance. This beast had no trouble in getting a first, with Monarch of the Valley second. It was probably in the class bull, 2 years old and under 3 years, that the keenest contest prevailed, and there appeared to be a healthy rivalry between Mr. J. A. Montgomery's Renown of Mountain Home and Messrs. A. J. Caswell's and Franklin's Limelight of Raleigh. The choice fell on Renown of Mountain Home, a well-grown and stylish red.

In the younger classes strict culling was the order, and it was evident that the condition of the young bulls had a determining effect on the judgment.

The Groups.

The showing of groups and the progeny of breeders gave to the public an exhibition of what a dairy herd is like, and during the judging various expressions of opinions were voiced by onlookers, whose verdicts were in sympathy with the judge's decisions. In the breeders' group, Mr. A. Pickels came first and Mr. J. Phillips second. The exhibition groups also showed that Mr. A. Pickels was first and Mr. J. Phillips second. In the progeny stakes Messrs. Hickey and Sons secured first and Mr. A. Pickels second.

THE JERSEYS.

The Jerseys were fully representative of this wonderful breed, and around the ring was a large crowd of interested spectators. The judge was Mr. D. Walters, of Randwick (New South Wales). The decisions generally met with approval. In a brief chat the judge stated that the standard of the Jerseys was not up to that of previous years. It is evident that breeders of this class will require to cull rigidly, and acquire a habit of securing the very best class to breed from. The champion Jersey cow, Messrs. E. Burton and Sons' Oxford Golden Buttercup, was a faultless animal, and the breeders, who are well known throughout the Jersey world, should feel proud of such a bonny beast. This cow also annexed the blue ribbon as a four -year-old, in calf or dry. The reserve champion, Messrs. W. Spresser and Sons' Lucy's Pocket, was an equally attractive animal, and was favourably commented upon. She was placed first in her class, cow, 5 years old or over, in milk. For cow, 3 years old and under 4 years, in milk, a keen contest raged. In this class Messrs. E. Burton and Sons' Oxford Daffodil won a merited first, with Trinity Columbine second. The section heifer, 1 year old and under 2 years, in milk, which was a very heavy class, proved to be one of the most interesting of the day. They were a very pretty lot of animals, and were generally in good condition. Mr. E. Burton's Oxford Aster came first, with a close runner-up in Messrs. Spresser and Sons' Lockit's Pride. In the heifer, 18 months old and under 2 years, there was healthy rivalry, and Oxford Dianthus stood gracefully while the blue ribbon was being placed, and Mr. P. J. O'Shea's Middenbury Golden Lass was rather happy at securing second position.

The Bulls.

The Jersey bulls of the aged class looked well, although some were presented in a rather ungroomed condition. The champion bull, Mr. W. W. Mallet's Trinity Darby (awarded the championship at the 1929 show), was a beast worthy of the best traditions of the breed. The reserve champion, Mr. T. A. Petherick's Trecarne Golden King, is a splendid sire. In the class for bulls, 2 years old and under 3 years, Messrs. Matthew Bros.' Trinity Goodwin had little trouble in securing first place, with Mr. B. J. Jensen's Kelvinside Noble's Chieftain a well-merited second. In the younger classes of bulls there appeared to be a "tail," and culling by the judge was noticed. In the class of bull, 18 months old and under 2 years, Mr. J. Williams's

Trinity Armlet won. For bull, 12 months old and under 18 months, Treearne Renown was successful, after a very keen contest. The breeders' and sire and progeny groups proved an exhibition of great interest.

THE AYRSHIRES.

As a utility dairy breed it is difficult to find cattle to excel the Ayrshires, and great interest was displayed in this attractive class. The judge, Mr. J. A. Bond, of Dandenong (Victoria), was a very careful adjudicator. Mr. Bond was impressed generally with the Ayrshires presented, and his remarks concerning the champion bull were certainly encouraging. His opinion of the champion cow and bull was that they would command attention in any show ring. The champion Ayrshire cow, 3 years old and under 4 years, in milk, was Messrs. J. H. and R. M. Anderson's Fairview Lady Jean, a rich brown and white beast, with all the attributes of a great milker, and of healthy appearance. The reserve champion was an equally attractive animal, Mr. G. Norgaard's Tina IV. of Longlands. This great animal is possessed of very fine proportions, and bears evidence of great breeding. The same beast gained first place in her class as cow 4 years old or over, in calf 6 months, or dry. In the section of cow, 3 years old and under 4 years, in calf, Messrs. J. H. and R. M. Anderson's Fairview Hannah gained first place, with Stimpsons Ltd. Elersley a well-merited second. The younger females were in small numbers, and were in fair condition, especially cattle from the Downs, which had apparently been running on the wheat fields. The group of three heifers, under 3 years, was an attractive lot, and Mr. Thomas Holmes secured first place, with Messrs. J. H. and R. M. Anderson a good second.

The Bulls.

The aged bulls were a presentable lot, and were mostly in good condition, although possessing a want of bloom. For a bull, 4 years old or over, Messrs. J. H. and R. M. Anderson's Longlands Bonnie Wilk gained first, and at a later period was crowned champion. The reserve champion, Mr. Thomas Holmes's Claredale Bonnie Billy, was an upstanding animal, with a wonderful appearance. In the class of bull, 2 years old and under 3 years, Stimpson's Eleresley Grand was placed first, Mr. G. Norgaard's Holm Park Baden came second. The groups of Ayrshires were splendid specimens, and the breeders' group was in every way indicative of the advance which has been made in recent years. The award in this class was won by Messrs. J. H. and R. M. Anderson, with Stimpsons Ltd. second. For the breeders' junior group, Mr. Thomas Holmes came first, with Mr. J. C. Mann second. The exhibitors' group was won by Messrs. J. H. and R. M. Anderson.

THE FRIESIANS.

The Friesians created interest, and this big-boned class of dairy stock appear to be holding their own. The judge, Mr. P. C. Pryce, of Toogoolawah, stated that the breed was in every way sustained, and the class of cattle placed before him were a very creditable lot. In the section, cow, 4 years old or over, in milk, Messrs. Hickey and Sons' College Princess Pontiac won first prize, and in the cow, 3 years old and under 4 years, in milk, the same breeders annexed a first with Stoneybrae Wallflower. In the cow, 4 years old or over, in calf, Messrs. David Young and Sons came first with Inavale Shield. The champion Friesian cow was an upstanding beast, possessing great bone and length. Messrs. Hickey and Sons' College Princess Pontiac gained the coveted champion sash, with Mooloombin Pontiac Girl reserve champion. The younger females were poorly represented.

The Bulls.

It was probably in the Friesian bulls that the chief interest was manifested, and the judge, in placing the champion ribbon on Messrs. David Young and Sons' Colossus of Stathan, was on safe ground, as this animal possessed in a marked degree the characteristics of the breed. The reserve championship went to Mr. W. H. Gram's St. Athan Actuary, a descendant of Pier Rock, a beast known years ago in the show ring. The exhibitors' group was won by Messrs. Hickey and Sons, and the sire and progeny group by Messrs. David Young and Sons.

THE GUERNSEYS.

The Guernseys were poorly represented, and the judge, Mr. G. Elliott, of Lismore (New South Wales), got through his task in quick time. Mr. Elliott's opinion was that the standard of the Guernseys was not up to that of two or three years ago. The cattle on the whole presented rather a rough appearance, and showing points were somewhat neglected. The champion bull, however, would compare favourably with any of his class in New South Wales. This was Mr. W. Cooke's Linwood Favour, a descendant of Shamrock X. of Wollongbar, and the reserve championship was awarded to Mr. A. J. Cranney's Linwood Royal's Laddie. The prize for a bull calf, 6 months old and under 12 months, was won by Mr. W. Cooke's Laureldale Viceroy, and the second position was annexed by Mr. H. T. Blanch's Linwood Lone Star.

Cows and Heifers.

The females in the aged class were poorly represented, and for a cow, 4 years old or over, in milk, the first prize was awarded to Mr. H. T. Blanch's Minnamurra Dairymaid, with Pearl XII. of Boorie second. The champion Guernsey cow was Mr. H. T. Blanch's Minnamurra Dairymaid, and the same exhibitor annexed the reserve championship with his Moongi Pearl's Pet. The younger cattle were in rather poor condition, and excited little comment.

PLATE 78.—KEENLY INTERESTED IN THE RING EVENTS.
The Minister for Agriculture and Stock, Hon. Harry F. Walker, and the State Treasurer, Hon. W. H. Barnes.

PLATE 79.—COY OR CAMERA SHY. A HEREFORD QUEEN.

Mr. P. Reynolds' Hobartville Lady Minerva, First and Champion in the 2 years old and under 3 years, Cow or Heifer Class, paraded by her owner for the admiration of the Governor and Lady Goodwin.

THE MEAT INDUSTRY.

AN EXCELLENT EXHIBIT.

Mr. Ernest Baynes, the President of the Royal National Association, is well qualified to discuss the problems of the meat industry, and he was listened to with attention by the large gathering present at the opening of the Meat Industry Hall at the Brisbane Exhibition. Observing that the exhibit was the fourth of the Show, he said that its object was threefold—to demonstrate how the various parts of the animal could be utilised; to encourage better methods of production; and to establish a better understanding of the economic importance of live stock and of the industries associated with it. He explained that 98 per cent. of the occupied territory of the Commonwealth was grass land, the product of which must find an outlet through live stock, and that of the remaining 2 per cent. devoted to agriculture approximately 90 per cent. was used for the production of grain and fodder, which must either find an outlet through live stock or be dependent on live stock for the economical production of grain. Despite that situation, however, they found that Australia was supplying about 8 per cent. of beef, 11 per cent. of lamb, and practically nothing of Great Britain's pig product requirements. The conclusion to be drawn was that the best solution to the Commonwealth's heavy indebtedness was more live stock—particularly meat-producing animals. The exhibit was valuable, because it analysed the situation thoroughly and offered pointers to prosperity in all branches of primary production. He emphasised the final message quoted in the hall—"There is a great need for every section of the country to increase its supply and improve the quality."

The Premier's Speech.

The Premier (Mr. A. E. Moore), officially opening the hall, said that all the leading features connected with the live stock husbandry had been collected, and artistically and graphically described. The information displayed on every exhibit brought home to the people what the live stock industry and its by-products meant to Australia. Mr. Baynes had told them that 8 per cent. of Australia was grass land—not by any means all of it was good grass land—but all of it could be used by scientific fertilisation, and all of it was possible of enormous expansion. It was gratifying to know that efforts were being made by the Bureau of Science and Industry, in conjunction with the Queensland Government, to extend the knowledge of what artificial fertilisers would do to pastures, and what licks and stock foods meant to the cattle industry and to meat production.

The Export Trade.

The Premier stated that in 1909 Australia supplied 26 per cent. of the lamb exported to England, and in 1929 only 8 per cent. In that time England had doubled its importations from 5,000,000 to 10,000,000 carcases, which showed that there was a big opportunity for lamb breeding in Queensland, especially in the Darling Downs. There was also a big field for veal. The State abattoirs would give opportunities in Queensland for providing and selling meat of the highest quality. Queensland should develop the live stock industry with greater intensity—not only in the interests of the people who grow the stock, but in the interests of Australia. We had a large Empire market and other avenues for our products, and we should develop them.

Doubling the Capacity.

Mr. Moore said that he had been much impressed by a remark by Sir George Julius (Chairman of the Bureau of Science and Industry), that if the people of Australia would only make use of the knowledge they had already gained by science in agriculture and go in for top-dressing and stock feeding rather than looking around for more land they could double the capacity of Australia in two years. He (Mr. Moore) was satisfied from what he had seen that that could be done. The meat industry exhibit was another proof of it. The exhibit was of educational value, not only to the general public but to the producers, because it showed them what they ought to aim at—waste products being converted into valuable exportable surplus. The Royal National Association was to be congratulated in making that wonderful exhibit available; it would have a beneficial effect on the future prosperity of Australia.

An Excellent Exhibit.

Mr. J. B. Cramsie (Meat Industry Board, New South Wales) said the exhibit could not be excelled anywhere. Throughout the hall were lessons written in texts that everybody should read. They learned that the Argentine in 1909 exported 600,000 lambs, and in 1928 3,600,000, whereas Australia in 1909 exported 1,300,000 and in

PLATE 80.
The Premier (Mr. Moore) was keenly interested in the Ring Events.

1928 1,150,000. Australia had gone back, whereas Argentine had come on six times. Last year Canada sent huge quantities of bacon to the markets of Great Britain, and took her share of the £56,000,000 that was paid for pig products by the mother country. Australia exported a miserable £5,000 worth of pig products. There was no reason why Australia should not export a very much larger quantity than that. He hoped that Australia would organise the live stock and meat industry until it got a fair share of the British market. We built that market, and were entitled to a fair share of it.

Mr. Eric Sparkes (President of the Queensland Meat Traders' Association) moved a vote of thanks and appreciation to the Royal National Association, which was supported by Mr. W. C. Watkins and Mr. A. B. Anderson. Mr. J. Hiron (chairman of the council) responded.

BEEF CATTLE AT THE SHOW.

Queensland being the most important cattle-producing State in the Commonwealth, it is not surprising that one of the chief features at the show each year is the fine display of stud cattle, particularly of the beef varieties. On this occasion the exhibits in the beef section were of a particularly interesting character, there being entries from leading breeders in the Southern States. In some cases—particularly in the Hereford classes—the chief prizes were annexed by cattle which had won awards at the Sydney Royal, but no one will grudge the victory to the visitors, who had the enterprise to bring their stock many hundreds of miles to Brisbane. The cattle from the other States in all instances met with keen competition on the part of Queensland-bred cattle, and they won on their merits. In those classes in which breeders from the Southern States were victorious, local breeders were afforded a demonstration which will stimulate them to further improve their herds. Without exception, the judges expressed high commendation of the manner in which the locally-bred cattle had been prepared for the show. No pains had been spared to make them attractive to the judge's eye. The keenness of the competition called for extra care on the part of the judges. The larger number of entries in this class—a record in the history of the show—entailed considerably more work on the part of the officials, but every exhibit was accorded careful scrutiny. The judge commented that only in very exceptional cases was a beast shown which did not merit consideration of its claims to an award.

The general verdict of all the judges was that the stud beef exhibits this year were much superior to what had been seen on any previous occasion, showing that local breeders are adopting every means of improving their herds. It was observed that in regard to the principal breeds—Shorthorns, Herefords, and Aberdeen-Angus—the judges prefaced their comments by the remark: "There is a marked improvement in quality this year." The judging proved that this was the case. In some instances cattle which had won last year failed to score. In many instances younger cattle took the places on the prize list, which had been held for several years by doyens of the show ring. The quality shown in the young stock was such that we may confidently anticipate that next year competition will be still keener and the standard still higher.

His Excellency the Governor (Sir John Goodwin) and also Lady Goodwin showed a lively interest in the judging of the beef breeds, and particularly of the Herefords. His Excellency has a thorough knowledge of the points which the judges take into consideration, and he expressed his admiration of the quality of the cattle presented.

SHORTHORNS.

The popularity of the Shorthorn breed in Queensland was amply demonstrated by the large number of entries in this section, and the closeness of the competition in nearly every class. The judge was Mr. Lomax, whose reputation as a breeder, as well as a judge, stands so high that in every instance his decision was cheerfully accepted. At the close of the day's judging, Mr. Lomax said that there were some cattle of outstanding quality in this section, and the fact that they were bred in Queensland was highly creditable to this State.

Last year the Gindie State Farm exhibits won the championship for Shorthorn bull, with Milton Tribesman III., but he was not shown this year. The championship fell to Mr. J. T. Scrymgeour's roan bull, Netherby Royal Challenge, which is under two years of age. This is a deep-fleshed level youngster, showing good masculinity, and well let down. The judge expressed the opinion that if he had had a little more condition he would have shown to even greater advantage in the show ring.

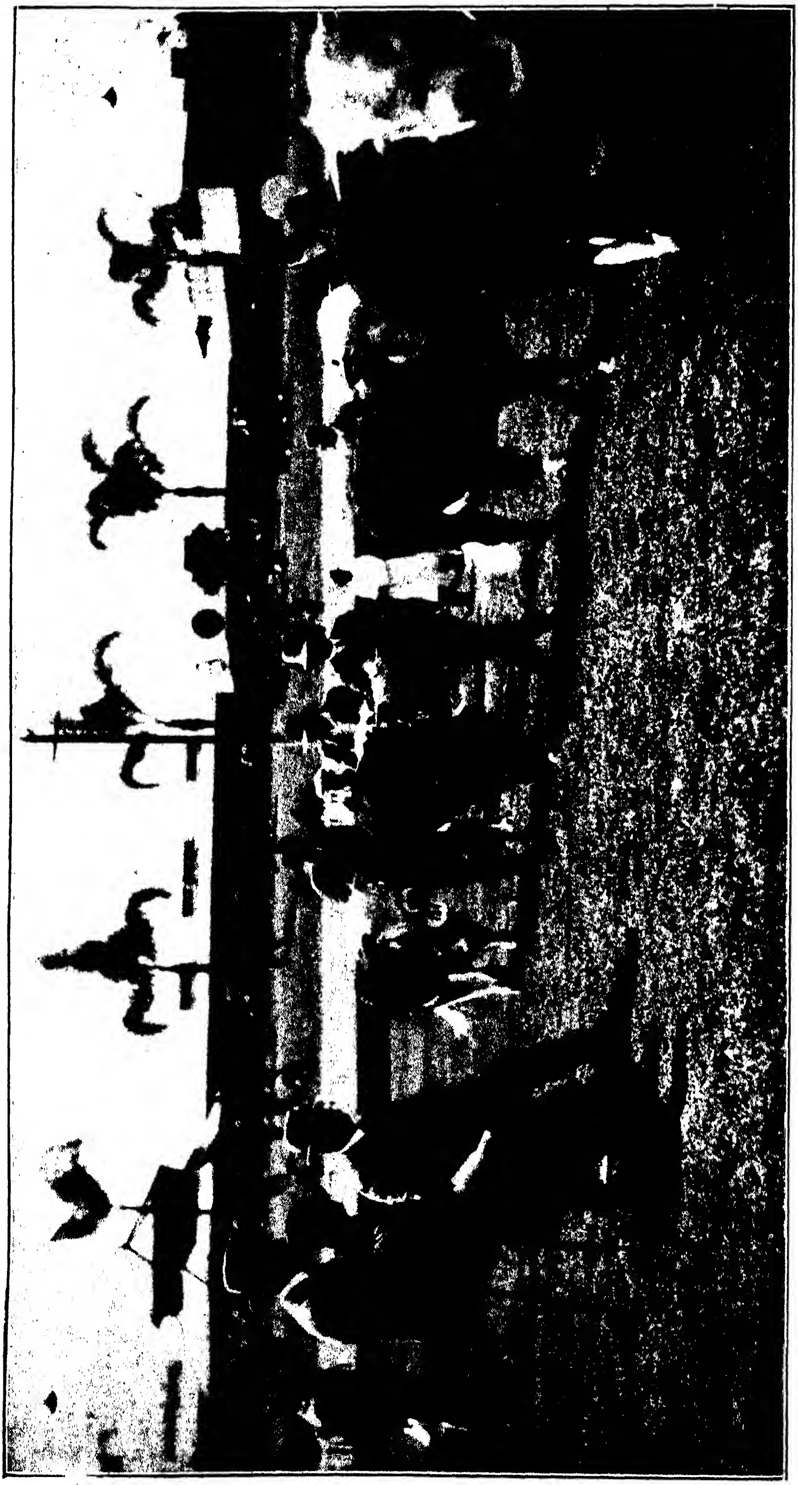


PLATE 81.—HEREFORDS IN THE JUDGING RING.
Sir John and Lady Goodwin, with Mr. Ernest Baynes, were keenly interested in the Stock Parade.

He hesitated for quite a while between this young bull and Milton's Grandmaster, a dark-red three-year old bull belonging to the same owner. His reason for deciding in favour of Netherby Royal Challenge was that he had a little more depth and thickness, notwithstanding the fact that he was giving away a considerable amount in age. The reserve championship thus fell to Milton's Grandmaster.

The championship for the Shorthorn cow provided a very close struggle between a three-year-old heifer, Mr. J. McDougall's Lyndhurst Lily of Gurley II., and a white cow, Mr. J. T. Scrymgeour's Milton's Lovely VI. Ultimately the decision was given in favour of the heifer, which showed much quality and great promise. The judge remarked upon her evenness, and said he expected she would develop into a remarkably fine shower. Milton's Lovely was awarded the reserve championship. This cow was bred by Mr. Anthony Hordern, of New South Wales, many of whose stock have won prizes at the Brisbane shows.

As usual most of the prizes in this section fell to Mr. J. T. Scrymgeour, who owns the fine stud at Netherby, near Warwick.

''Taken all round,'' remarked the judge, ''the cattle showed considerable improvement on past years, and reflect great credit upon the local breeders. Mr. Scrymgeour deserves to be especially complimented upon the condition in which he presented his cattle.''

HEREFORDS.

''There has never been a finer exhibition of Herefords in Brisbane,'' declared Mr. J. A. Beattie, the Narrandera (N.S.W.) breeder, who officiated as judge. The competition throughout was very keen, and in several instances the judge had great difficulty in making a decision. In the case of the contest for the bull championship, he had to decide between the merits of Mr. P. Reynolds's Hobartville Hercules, a young bull, and the aged bull, Eaton Victor 51st, bred and exhibited by Wilson and McDouall Ltd. Hobartville Hercules had already been awarded the junior championship, and the judge questioned whether that should not preclude him from winning the senior award. The steward, however, pointed out that the conditions of the competition did not provide for that. Indeed, it was shown that five years ago Royal Renown had been awarded both the senior and junior championships. So once more youth won the honours. The champion bull was under two years of age, brimful of quality, and was shown in perfect condition. The judge specially remarked upon its compactness of body, its general high quality, and particularly its thickness and depth of flesh. The reserve champion bull, Eaton Victor 51st, was bred by Wilson and McDouall Ltd., at Calliope Station, Queensland. This bull won the junior championship and reserve championship at the Brisbane Show three years ago.

The championship on the female side also fell to Mr. P. Reynolds, through the agency of Hobartville Lady Minerva 17th, who won the reserve championship at the recent Royal Sydney Show. The runner-up in this instance was Mr. E. R. Reynolds's Ennisview Lady Miss, bred at Oakey (Queensland). The contest was very close.

Mr. Raymond Reynolds, who manages the Hobartville Stud at Richmond (N.S.W.) for his father, Mr. E. P. Reynolds, has shown in Brisbane on previous occasions, but was absent last year, being engaged in officiating as judge elsewhere. He is regarded as one of the best judges of Herefords in the Commonwealth. Queensland appreciates his enterprise in bringing stud stock such a long distance to compete in the show, and his remarkable successes were not begrudged by the competitors. In 1928 he brought four head of Herefords to Brisbane, and secured the senior and junior championships and a reserve championship, as well as five first prizes. On the present occasion, with five head of stock, he captured the championship for bulls and also for cows, and the junior championship for bulls, as well as seven first prizes.

ABERDEEN-ANGUS.

Mr. T. Crawford, the judge of the Aberdeen-Angus section, said that this breed was becoming more popular every year, as was indicated by the increased entries at the Brisbane Show. The exhibits this year were of remarkably high quality, being equal to any seen at provincial shows in the old country. The Aberdeen-Angus breed was particularly suitable for the export trade, and he was, therefore, pleased that the exhibits on this occasion were three times as numerous as last year. The cattle shown fully demonstrated the characteristics of the breed—solid flesh and small bone, which represented economy on the consumer's table. They were a fast-maturing breed, and, unlike some other breeds, did not run to too much fat. Queensland would be moving along sound lines if this breed were introduced more largely on the big stations.

THE AWARDS.

DISTRICT COMPETITIONS—"A" GRADE.

WITH a magnificent and comprehensive display of primary products and manufactures, far excelling those of previous years, the North Coast and Tablelands of New South Wales won the coveted Chelmsford Shield in the contest for "A" grade district exhibits, and retrieved the laurels lost last year. The winning exhibit had a margin of 58½ points over Wide Bay, with the South Coast of Queensland third, 4½ points away.

There is always concern in this contest, and this year there was more discussion and conjecture than ever, which is proof to the National Association that the arranging of such events meets with popularity, not only from the fact of advertising the districts that have arranged the exhibits, but in showing the advancement that is being made in both primary production and manufactures. The maximum points allowed was 1,565, out of which the North Coast and Tablelands District were awarded 1,186, thus securing first place, being 58½ points ahead of Wide Bay and Burnett, with the total of 1,127½ points. The South Coast of Queensland obtained 1,123, which is only 4½ points behind Wide Bay. The Tablelands District of New South Wales thus secured the Chelmsford Shield for a further term. Details:—

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District
DAIRY PRODUCE—				
Butter (1 box, 56 lb.)	90	84½	84	83
Milk and by-products	40	6	4	2
Cheese	60	35	40	30
Eggs	20	16	14	13
Totals	210	141½	142	128
FOODS—				
Hams and bacon	50	46	48	40
Rolled and smoked beef and mutton	20	18	18	20
Small goods and sausages—smoked or preserved	10	9	8	8
Fish, smoked, preserved, or canned	10	7½	8½	7½
Canned meats	25	21	20	20
Lard, tallow, and animal oils	20	18	18	19
All butchers' by-products	10	7	8	6
Honey and by-products thereof	20	17	18	18
Confectionery, factory made	10	8	9	7
Bread, scones, cakes, and biscuits	10	8	9	8
Totals	185	159½	164½	153½
FRUITS, VEGETABLES, AND ROOTS—FRESH AND PRESERVED—				
Fresh fruits	60	48	52	56
Preserved fruits, jams, and jellies	30	28	30	25
Crystallised and dried fruits	20	18	17	17
Preserved and dried vegetables, pickles, sauces	10	9	8	8
Fresh vegetables	20	15	16	18
Table pumpkins, squashes, and marrows	6	5	4	4
Potatoes, English and sweet	40	20	32	22
Roots (including meals)	14	9	12	10
Coconuts, peanuts, and other nuts	10	9	6	7
Totals	210	161	177	167

DISTRICT COMPETITIONS ("A" GRADE)—*continued.*

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District
CEREALS AND BY-PRODUCTS—				
Wheat	50	45	20	30
Flour, bran, pollard, macaroni, and other meals derived from wheat ..	10	7	5	9
Maize	50	43	30	33
Maizena, meals, starch, glucose, and cornflour	10	4	4	5
Oats, rye, rice, barley, malt, pearl barley, and their meals	30	24	20	23
Totals	150	123	79	100
MANUFACTURES AND TRADES—				
All woodwork	30	25	30	25
All metal and ironwork	30	20	25	30
Manufactured woollen and cotton fibre ..	30	24	20	10
Leather and all leather work and tanning ..	20	15	10	10
All sheet-metal work	10	5	10	7
Artificial manures	10	4	8	6
Brooms and brushes	10	7	9	2
Manufactures, not otherwise enumerated ..	15	10	13	11
Totals	155	110	125	101
MINERALS AND BUILDING MATERIALS—				
Gold, silver, copper, and precious stones ..	25	20	4	20
Coal, iron, other minerals, and salt ..	30	20	9	20
Stone, bricks, cement, marble, terra-cotta	20	10	15	15
Woods, dressed, undressed, and polished ..	25	20	20	25
Totals	100	70	48	80
TROPICAL PRODUCTS—				
Sugar cane	60	53	57	55
Sugar, raw and refined	20	15	10	19
Rum, other spirits, and by-products ..	10	..	8	10
Tobacco (cigar and pipe), in leaf	20	16	10	10
Coffee, raw and manufactured, tea, spices, and essences	10	6	6	6
Cotton (raw) and by-products	30	18	20	22
Rubber	10	4	4	..
Oils (vegetable)	10	5	5	5
Totals	170	117	120	127
WINES, &c.—				
Wines	15	12	5	9
Aerated and mineral spa water, vinegar, and [illegible] and cordials	10	7½	6	7
Ales and stout	10	..	..	7
Totals	35	19½	11	23

DISTRICT COMPETITIONS ("A" GRADE)—*continued.*

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District.
HAY, CHAFF, FODDER, &c.—				
Hay (in bale)—Oaten, wheaten, lucerne, and other varieties	30	28	22	18
Hay in sheaf	5	3	4½	3½
Grasses and their seeds	10	9	8½	6
Chaff—Oaten, wheaten, lucerne, and other varieties	50	44	42	36
Ensilage and other prepared cattle fodder..	20	13	13	16
Sorghums and millets, in stalk	10	8	8	9
Commercial fibres	15	11	12	11
Pumpkins, green fodder, and fodder roots ..	12	7	10	7
Broom millet	10	6½	5½	7½
Farm seeds, including canary seed ..	13	10	9	9
Totals	175	139½	134½	123
WOOL, &c.—				
Scoured wool	10	10	8	8
Greasy wool	70	70	40	50
Mohair	10	8	5	7
Totals	90	88	53	65
ENLARGED PHOTOGRAPHS—				
Of District Scenery and locally bred live stock	5	5	3	3
EFFECTIVE ARRANGEMENT—				
Comprehensiveness of view	20	13	16	16
Arrangement of sectional stands	25	17	21	20
Effective ticketing	10	7	9	4
General finish	25	15	20	17
Totals	80	52	66	57

SUMMARY OF POINTS.

Dairy produce	210	141½	142	128
Foods	185	159½	164½	153½
Fruits, culinary, vegetables, and roots	210	161	177	167
Cereals and by-products	150	123	79	100
Manufactures and trades	155	110	125	101
Minerals and building materials	100	70	48	80
Tropical products	170	117	120	127
Wines, &c.	35	19½	11	23
Hay, chaff, fodder, &c.	175	139½	134½	123
Wool, &c.	90	88	53	65
Enlarged photographs	5	5	3	3
Effective arrangement	80	52	66	57
Totals	1,565	1,186	1,123	1,127½

	Points.
North Coast and Tablelands, New South Wales (First)	1,186
Wide Bay and Burnett (Second)	1,127½
South Coast of Queensland (Third)	1,123

DISTRICT COMPETITIONS—"B" GRADE.

Brisbane Valley, for the fifth consecutive year, prevailed in the competition for "B" grade district exhibits, which are confined to primary production. Mount Larcom was second, and the Northern Darling Downs third. The winning exhibit was an excellent display, and reflected great credit on the organisers.

The excellent presentations made by the districts entered for the "B" grade competitions in the district displays met with no less appreciation than what was manifested in those of the "A" grade. Competitions were confined to localities wherein only primary production is in evidence. The efforts of the Brisbane Valley management and their supporters were successful in securing the first prize, conjoined with which is the valuable trophy presented by the chairman of the National Association Council, with the total of 989½ points out of the maximum of 1,285, which is a most creditable win.

Mount Larcom committee and workers are to be congratulated on securing second place, with the total of 920½ points. More especially is such the case when the long distances covered in conveying the exhibits is taken into consideration. Northern Darling Downs was third with 902 points. Details of the awards are:—

—	Maximum points.	Mount Larcom.	Oakey.	Kingaroy.	Brisbane Valley.	Northern Darling Downs.	Nanango.
DAIRY PRODUCE—							
Butter (1 box, 56 lb.) ..	90	81	83½	83½	82	83	83
Cheese	60	23	50	50	20	56	45
Eggs	20	15	13	14	15	15	14
Totals	170	119	146½	147½	117	154	142
FOODS—							
Hams, bacon, rolled and smoked beef and mutton	50	43	47	44	41	42	42
Fish—Smoked	10	8	5	3	3½	3	5½
Lard, tallow, and animal oils..	20	17	17	18	19	18	15
Honey and by-products thereof	20	14	12	15	17	11	9
Confectionery (home made) ..	10	6	8	8	8	8	7
Bread, scones, cakes, and biscuits (home made) ..	10	8	8	9	7	6	8
Totals	120	96	97	97	95½	88	86½
FRUITS, CULINARY, VEGETABLES, ROOTS, &c. (Fresh and Preserved)—							
Fresh Fruits	60	48	25	40	50	42	20
Preserved fruits, jams, and jellies (home made) ..	30	24	22	22	25	24	22
Crystallised and dried fruits (home made or dried) ..	20	18	18	16	18	14	14
Preserved and dried vegetables, pickles, sauces (home made or dried)	10	8	6	7	8	7	8
Fresh vegetables, all kinds, excluding potatoes)	20	16	17	14	18	15	14
Table pumpkins, squashes, and marrows	6	5	5	5	5	5	6
Potatoes, English and sweet ..	40	23	21	30	35	21	32
Roots and their products, including meals, arrowroot, cassava, ginger	14	10	6	7	12	8	5
Coconuts, peanuts, and other nuts	10	6	7	9	8	7	7
Vegetable seeds	10	6	4	8	7	5	6
Totals	220	162	131	158	186	148	134

DISTRICT COMPETITIONS ("B" GRADE)—*continued*.

—	Maximum points.	Mount Larcom.	Oakey.	Kingaroy	Brisbane Valley.	Northern Darling Downs.	Nanango.
CEREALS AND BY-PRODUCTS—							
Wheat	50	29	44	27	33	45	35
Flour, bran, pollard, macaroni, and other meals	10	8	5	5	5	8	5
Maize	50	34	34	36	46	38	40
Maizena, meals, starch, glucose, and cornflour	10	8	5	7	5	5	8
Oats, rye, rice, barley, malt, pearl barley, and their meals	30	21	23	19	25	17	15
Totals	150	100	111	94	114	113	103
WOODS—							
Woods, dressed, undressed, and polished	25	20	18	20	25	20	20
Wattle bark	15	10	12	15	15	10	10
Totals	40	30	30	35	40	30	30
HIDES (1) AND HOME PRESERVES—							
Skins for domestic use ..	15	13	12	11	11	10	10
TROPICAL PRODUCTS—							
Sugar-cane	60	40	4	9	16	6	7
Coffee, tea, and spices ..	10	5	..	7	7	5	6
Cotton (raw) and by-products	30	22	20	20	25	22	18
Tobacco (cigar and pipe), in leaf	20	12	14	16	16	12	14
Totals	120	79	39	52	64	45	45
MINERALS—							
Gold, silver, copper, and precious stones	25	17	6	12	16	9	12
Coal, iron, and other minerals, and salt	30	17	10	16	20	14	12
Totals	55	34	16	28	36	23	24
HAY, CHAFF, FODDER, &c.—							
Hay (in bale)—Oaten, wheaten, lucerne, and other varieties	30	18	23	20	28	23	20
Hay in sheaf	5	3½	4	4	3½	4	3½
Grasses and their seeds ..	10	7	9	9	9½	8½	7
Chaff—Oaten, wheaten, lucerne, and other varieties ..	50	34	38	30	48	28	32
Ensilage and other prepared cattle fodder	20	15	12	13	17	14	13
Sorghums and millets ..	10	8	7½	7½	9	9	7½
Commercial fibres, hemp, and flax	15	13	6	6	14	12	10
Pumpkins, green fodder, and fodder roots	12	8	10	8	10	9	9
Broom millet, ready for manufacture	10	6	6½	8	9	9	9
Farm seeds, including canary seed	13	9	10	8	11	8	10
Totals ..	175	121½	126	113½	159	124½	121

DISTRICT COMPETITIONS ("B" GRADE)—*continued.*

—	Maximum points.	Mount Larcom.	Oakey.	Kingaroy.	Brisbane Valley.	Northern Darling Downs.	Nanango.
WOOL, &c.—							
Scoured wool	10	8	9	5	8	10	5
Greasy wool	70	63	70	55	45	65	55
Mohair	10	6	9	6	7	8	5
Totals	90	77	88	66	60	83	65
ENLARGED PHOTOGRAPHS—							
Of District scenery and locally bred live stock	5	3	4	4	4	4	2
LADIES' AND SCHOOLS WORK AND FINE ARTS—							
Needlework and knitting ..	25	18	12	18	25	16	14
School needlework	5	1	1	2½	5	1½	2
Fine arts	5	3	3	5	3	4	4
School work—Maps, writing, &c.	10	6	8	7	8	5	9
Totals	54	23	24	32½	41	26½	29
EFFECTIVE ARRANGEMENT—							
Comprehensiveness of view ..	20	16	16	14	16	15	14
Arrangement of sectional stands	25	16	20	16	18	15	16
Effective ticketing	10	7	7	5	7	5	5
General finish	25	19	21	15	21	18	15
Totals	80	58	64	50	62	53	50

SUMMARY OF POINTS.

Dairy produce	170	119	146½	147½	117	154	142
Foods	120	96	97	97	95½	88	86½
Fruits, culinary, vegetables, roots, &c.	220	162	131	158	186	148	134
Cereals and by-products	150	100	111	94	114	113	103
Woods	40	30	30	35	40	30	30
Hides and home preserved skins ..	15	13	12	11	11	10	10
Tropical products	120	79	38	52	64	45	45
Minerals	55	34	16	28	36	23	24
Hay, chaff, fodder, &c.	175	121½	126	113½	159	124½	121
Wool, &c.	90	77	88	66	60	83	65
Enlarged photographs	5	3	4	4	4	4	2
Ladies' and schools work and fine arts	45	28	24	32½	41	26½	29
Effective arrangement	80	58	64	50	62	53	50
Totals	1,285	920½	887½	888½	989½	902	841½

First and Chairman's Trophy, Brisbane Valley; Second, Mount Larcom; Third, North Darling Downs.

ONE FARM.

FOUR EXCELLENT ENTRIES.

There was convincing proof that life in the country can be made pleasant where there is harmony in family associations; and that homes in the country have pleasures and enjoyments in many ways not known in the towns and cities. The maximum number of points was fixed at 656, out of which Mr. Ponton, who won last year, secured 510½. Mr. J. T. Whiteway, of Buderim, was second, with 505½, being only five points behind Mr. Ponton. Mr. E. J. Rossow, of Nanango, was third, with 482, and Mr. J. Beck, from the Stanwell district, of Central Queensland, fourth, with 480. There is thus shown how close was the competition. Details of the awards are:—

——	Maximum Points.	J. T. Whiteway, Buderim.	E. J. Rossow, Nanango.	J. Beck, Stanwell.	W. D. Ponton, Tuggerah, N.S.W.
PRODUCE—					
Butter	25	22½	19	22	21½
Eggs	5	3	2	2½	5
Totals	30	25½	21	24½	26½
FOODS—					
Hams and bacon (15 lb.)	20	15	17	17	19
Honey and by-products	15	15	8	7	12
Beeswax	5	3	2	2	4
Bread, scones	5	4	5	4	5
Confectionery	5	5	4	4	4
Home cookery	7	6	6	5	5
Lard, tallow, and animal oils	5	4	4	5	5
Totals	72	58	54	54	62
FRUITS, VEGETABLES, AND ROOTS—					
Fresh fruits	25	20	10	15	12
Preserved fruits, jams, and jellies	15	13	10	12	13
Crystallised and dried fruits	10	9	6	7	9
Preserved and dried vegetables, pickles, and sauces	15	11	8	8	12
Fresh vegetables	15	13	12	11	11
Table pumpkins	10	8	9	8	9
Potatoes, English and sweet	20	13	19	10	13
Nuts	7	6	1	3	2½
Vegetable seeds	5	4	5	0½	5
Roots, all kinds	15	14	9	11	11
Home-made meals	3	3	2	2½	1½
Totals	140	114	91	88	99
CEREALS AND BY-PRODUCTS—					
Wheat	25	6	11	9	24
Maize	25	24	25	18	24
Barley, oats, rye, and rice	20	8	13	16	20
Home-made meals	10	9	10	8	10
Totals	80	47	59	51	78
TROPICAL PRODUCTS—					
Sugar-cane	30	18	10	17	4
Cotton in seed	20	10	12	18	14
Coffee	6	4	4	5	5
Tobacco leaf	10	7	7	7	8
Totals	66	39	33	47	31

ONE FARM—*continued.*

—	Maximum Points.	J. T. Whiteway, Buderim.	E. J. Rossow, Nanango.	J. Beck, Stanwell.	W. D. Ponton, Tuggerah, N.S.W.
HAY, CHAFF, FODDER, &c.—					
Hay..	20	16	18	20	20
Hay in sheaf	5	4	5	3½	5
Grasses and seeds	10	10	8	9	10
Chaff	20	17	19	20	17
Ensilage	15	13	15	14	9
Cattle fodder	15	14	15	13	11
Sorghum and millet	10	8	9	10	9
Broom millet	10	8	9	10	9
Farm seeds	7	6	6	5	7
Commercial fibres	10	10	8	7	10
Totals	122	106	112	111½	107
WOOL—					
Greasy	20	18	20	15	18
Mohair	5	3	5	5	4
Totals	25	21	25	20	22
Drinks, &c.	15	12	10	10½	9
WOMEN'S AND CHILDREN'S WORK—					
Needlework	10	9½	9	6	5
Fine arts	5	2	2	1	3
Fancy work	15	10	9	8	6
School work	5	5	4	4	3
School needlework	5	2	2½	3	2
Totals	40	28½	26½	22	19
Miscellaneous	10	9	7	7	10
Plants and seeds	6	6	5	5	5
Useful articles	10	9	7½	10	10
EFFECTIVE ARRANGEMENT					
Comprehensiveness	10	8	9	9	8
Arrangement	10	7	8	7	9
Ticketing	5	4½	3	3½	4
Finish	15	11	11	10	11
Totals	40	30½	31	29½	32

SUMMARY.

Produce	30	25½	21	24½	26½
Foods	72	58	54	54	62
Fruits and vegetables	140	114	91	88	99
Cereals and by-products	80	47	59	51	78
Tropical products	66	39	33	47	31
Fodder	122	106	112	111½	107
Wool	25	21	25	20	22
Drinks	15	12	10	10½	9
Women's and children's work ..	40	28½	26½	22	19
Miscellaneous	10	9	7	7	10
Plants and seeds	6	6	5	5	5
Useful articles	10	9	7½	10	10
Arrangement	40	30½	31	29½	32
Grand Totals	656	505½	482	480	510½

DISTRICT FRUIT CONTESTS.

Queensland's vast orchard wealth was illustrated remarkably by the imposing displays in the fruit pavilion. The bananas, in the opinion of the judge (Mr. A. G. Gordon), constituted the best exhibit for the past five years. The citrus exhibits were a profusion of excellence. A feature was an apple trophy from The Summit, the fruit being arranged in an imposing pyramid. It was awarded first prize. The pineapples were a delight to behold. Mr. J. P. Pringle (Woombye) gained first prize in smooth leaf pineapple and canning varieties. He practically swept the board in this branch, gaining the trophy for five pines in cases packed for export. The whole display in the pavilion was most effectively arranged by Mr. T. H. Brown, of Montville, and his assistants. Custard apples, strawberries, jack fruit, mandarins, oranges, papaw, grape fruit, and lemons were in a profusion of excellence, and drew from admiring crowds well deserved admiration. The judges, Messrs. A. G. Gordon, Wamuran, H. Wilmott, Victoria Point, and N. C. Richards, Howard, were unanimous in their praise of the general quality of all fruit sent in, both for the competitors and non-competitors' sections. Gayndah won the annual shield for the best display of pines, bananas, and citrus. For bananas the Cooran and Kin Kin Fruitgrowers' Association again won the shield. This association has now won the shield every year since its inception six years ago. A very noteworthy exhibit was a bunch of cavendish bananas shown by Mr. H. Cooper, Sarina. Details:—

—	Possible Points.	Buderim.	Cooran and Kin Kin.	Gayndah.	Montville.	Palmwoods.	Woombye.
Bananas	35	27	33	..	27	31	29
Pineapples	35	27⅔	20⅔	..	24½	30⅔	30½
Citrus fruits	35	27	14	33	32	32	28
Custard apples	10	6	5	..	9	7	7
Papaws	10	8	8	..	8	9	8
Strawberries	10	7	6	..	5	10	7
All other fruits	10	7	7	..	8	9	7
Grading and packing in export classes	35	26⅓	20⅓	11⅔	26⅔	30⅓	28⅓
General display	20	17	14½	18½	18	18½	16½
Totals	200	153	128½	63⅙	158⅙	177½	161⅓

BANANA SHIELD.

—	Quality.	Grading.	Packing.	Total.
COORAN AND KIN KIN—				
Cavendish	28	22	23	73
Lady Fingers	6	..	..	6
Sugars	2	..	..	2
Other varieties	4	..	..	4
				85
PALMWOODS—				
Cavendish	26	22	22	70
Lady Fingers	7	..	..	7
Sugars	2	..	..	2
Other varieties	2	..	..	2
				81

DISTRICT FRUIT CONTESTS—*continued.*

BANANA SHIELD—*continued.*

——	Quality.	Grading.	Packing.	Total.
WOOMBYE—				
Cavendish	24	22	21	67
Lady Fingers	8	..	..	8
Sugars	3	..	..	3
Other varieties	2½	..	..	2½
				80½
BUDERIM—				
Cavendish	22	21	20	63
Lady Fingers	9	..	..	9
Other varieties	2	..	..	2
				74
MONTVILLE—				
Cavendish	22	21	18	61
Lady Fingers	5	..	..	5
Sugars	1½	..	..	1½
Other varieties	3	..	..	3
				70½

CITRUS SHIELD.

GAYNDAH—				
Oranges	19	10	10	39
Mandarins	18	10	10	38
Lemons	10	2	3	15
Other varieties	3	..	..	3
				95
MONTVILLE—				
Oranges	19	9	10	38
Mandarins	18	10	10	38
Lemons	7	2	3	12
Other varieties	3½	..	..	3½
				91½
PALMWOODS—				
Oranges	19	10	9	38
Mandarins	18	10	10	38
Lemons	7	2	3	12
Other varieties	3	..	..	3
				91
WOOMBYE—				
Oranges	17	9	8	34
Mandarins	17	8	8	33
Lemons	5	2	3	10
Other varieties	3	..	..	3
				80

DISTRICT FRUIT CONTESTS—*continued.*

CITRUS SHIELD—*continued.*

——	Quality.	Grading.	Packing.	Total.
BUDERIM—				
Oranges	16	8	7	31
Mandarins	16	8	8	32
Lemons	8	2	2	12
Other varieties	3	..	..	3
				78
COORAN AND KIN KIN—				
Oranges	8	4	4	16
Mandarins	9	4	4	17
Lemons	3	1	1	5
Other varieties	2	..	..	2
				40

PLATE 82.—KEEN JUDGES OF HORSEFLESH.

Professor E J. Goddard (Dean of the Faculty of Agriculture, Queensland University) and Major-General Spencer Browne were interested in the Hacks and Hunters.

MILKING TESTS.

ANOTHER AUSTRALASIAN ENTRY RECORD.

The results of this year's milking contests reveal remarkable figures, and illustrate to all who have any knowledge of the dairying industry the high standard of quality attained by Queensland dairy breeders. The stewards of the section, Messrs. A. M. Hunt and J. Stimpson, both well-known breeders, spoke in high terms of what were truly great performances.

Those who undertake the supervision of the milking contests have no easy task, for not only has each milking to be closely watched, but the official who does the testing has a long and tedious time. There is also the necessity for some one other than the owner to be present at the milking of each cow or heifer, in which respect voluntary work was performed by many interested in the tests. For this assistance the supervising stewards expressed their appreciation. The first prize was won by Mr. B. O'Connor, with his Australian Illawarra Shorthorn, Rosette of Wilga Vale, which, with the yield of 5.8192 lb. butter fat, received 46.55 points. The reserve honour was secured by Mr. A. T. Waters for his Australian Illawarra Shorthorn, Fussy V. of Railway View, with 5.1486 lb. of butter fat, for which 46.09 points were allotted. Last year, Mr. A. Caswell won the prize with his Illawarra Milking Shorthorn, Rosie 4th of Greyleigh, with 4.9271 lb. of butter fat. The yield of Mr. O'Connor's Rosette of Wilga Vale is, therefore, ahead of what was recorded last year.

Mr. L. Anderson, Senior Herd Tester for the Department of Agriculture, in speaking on the gound milking tests, remarked that there had been a record for Australasia in the number of cattle that had been entered. The returns showed that the standard was well up to previous years. The competition was carried out at each show for a period of forty eight hours, commencing on the Saturday afternoon previous to the opening. In the younger classes high production was particularly noticeable, and in the heifers under 3 years old there were some wonderful returns. The competitions were for all breeds, the Australian Illawarra Shorthorns being strongly represented, and there were a fair number of Jerseys, Friesians, and Ayrshires.

The winner of the principal event, Rosette of Wilga Vale, which carries with it the title of champion, is a typical Australian Illawarra Shorthorn. Another animal to give an excellent yield was that confined to the Jersey breed, which was won by Mr. E. Burton's cow, between the ages of three and four years, Oxford Daffodil.

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours Points for lactation period being conceded.

——	Milk.	Fat.	Butter Fat	Points.	Lact. Points.	Total.
	Lb.	Per cent	Lb.			
B. O'Connor's Rosette of Wilga Vale (A.I.S.)—						
Night	21·7	4·4	·9548	..	..	..
Morning	27·1	3·8	1·0298	..	..	..
Noon	22·3	5·0	1·1150	..	..	..
Night	22·6	4·0	·9040	..	..	..
Morning	26·1	3·4	·8874	..	..	..
Noon	22·1	4·2	·9282	..	..	..
Total, 48 hours; average, 24 hours	141·9	..	5·8192 2·9096	.. 46·55	.. Nil	.. 46·55
A. T. Waters' Fussy V. of Railway View (A.I.S.)—						
Night	23·2	3·5	·8120	..	..	..
Morning	17·2	4·1	·7052	..	..	..
Noon	14·8	4·4	·6512	..	..	..
Night	15·8	4·3	·6794	..	..	..
Morning	17·7	4·2	·7434	..	..	..
Noon	15·3	4·5	·6885	..	..	..
Total, 48 hours; average, 24 hours	133·5	..	5·1486 2·5743	.. 41·19	.. 4·9	.. 46·09

MILKING TESTS—*continued.*

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours. Points for lactation period being conceded—*continued.*

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
	Lb.	Per cent.	Lb.			
J. Phillips's Myrtle IV. of Lemon Grove (A.I.S.)—						
Night	23·9	3·1	·7409	..	..	..
Morning	26·6	3·4	·9044	..	..	..
Noon	23·8	3·7	·8806	..	..	..
Night	23·4	4·1	·9594	..	..	..
Morning	25·8	3·1	·7999	..	..	..
Noon	23·1	3·7	·8547	..	..	..
Total, 48 hours; average, 24 hours	146·6	..	5·1398 2·5699	.. 41·12	.. 1·1	.. 42·22

Cow, three years old and under four years, averaging the greatest daily yield of butter for 48 hours. Points for lactation period being conceded.

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
E. Burton and Sons' Oxford Daffodil (Jersey)—						
Night	15·6	6·2	·9672	..	..	..
Morning	16·2	4·8	·7776	..	..	..
Noon	14·1	6·0	·8460	..	..	..
Night	14·5	5·7	·8265	..	..	..
Morning	15·4	4·5	·6930	..	..	..
Noon	13·1	5·2	·6812	..	..	..
Total, 48 hours; average, 24 hours	94·4	..	4·7915 2·3957	.. 38·33	.. Nil	.. 38·33
D. Spoor and Sons' Emma XI. of Springdale (A.I.S.)—						
Night	16·4	4·0	·6560	..	..	..
Morning	18·5	3·9	·7125	..	..	..
Noon	14·5	4·3	·6235	..	..	..
Night	14·3	3·9	·5577	..	..	..
Morning	17·3	3·9	·6747	..	..	..
Noon	13·4	4·1	·5494	..	..	..
Total, 48 hours; average, 24 hours	94·4	..	3·7828 1·8914	.. 30·26	.. 5·0	.. 35·36
J. H. Wade's Duchess of Wadedale (A.I.S.)—						
Night	16·1	4·5	·7560	..	..	..
Morning	17·2	4·1	·7502	..	..	..
Noon	14·8	4·4	·6512	..	..	..
Night	15·8	4·3	·6794	..	..	..
Morning	17·7	4·2	·7434	..	..	..
Noon	15·3	4·5	·6885	..	..	..
Total, 48 hours; average, 24 hours	118·0	..	4·2239 2·1118	.. 33·79	.. Nil	.. 33·79

MILKING TESTS—*continued.*

Heifer, under three years old, averaging the greatest daily yield of butter fat for 48 hours. Points for lactation period being conceded.

——	Milk.	Fat.	Butter Fat	Points.	Lact. Points.	Total.
J. Phillips's Melba of Sunny View (A.I.S.)—						
Night	18·2	2·9	·5278	..	..	..
Morning	20·9	2·5	·5225	..	..	..
Noon	18·4	3·1	·5704	..	..	..
Night	19·9	3·2	·6368	..	..	..
Morning	21·5	3·0	·6450	..	..	..
Noon	19·1	3·4	·6494	..	..	..
Total, 48 hours; average, 24 hours	118·0	..	3·5519 1·7759	.. 28·41	.. Nil	.. 28·41
Hickey and Sons' Glendalough Queen (A.I.S.)—						
Night	13·0	3·5	·4550	..	..	..
Morning	15·7	2·9	·4553	..	..	..
Noon	12·6	3·4	·4284	..	..	..
Night	12·8	3·3	·4224	..	..	..
Morning	16·0	3·0	·4800	..	..	..
Noon	12·0	3·4	·4080	..	..	..
Total, 48 hours; average, 24 hours	82·1	..	2·6491 1·3245	.. 21·19	.. 7·0	.. 28·29
J. Williams' Bonny Star of Lisieux (Jersey)—						
Night	8·5	5·8	·4930	..	..	..
Morning	10·1	4·9	·4949	..	..	..
Noon	8·4	6·4	·5376	..	..	..
Night	8·8	5·7	·5016	..	..	..
Morning	10·1	4·9	·4949	..	..	..
Noon	8·9	5·5	·4895	..	..	..
Total, 48 hours; average, 24 hours	54·8	..	3·0115 1·5057	.. 24·09	.. 3·8	.. 27·89

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours.

——	Total Milk.	Total Butter Fat	Average Butter Fat
	Lb.	Lb.	Lb.
B. O'Connor's Rosette of Wilga Vale (A.I.S.)	141·9	5·8192	2·9096
A. T. Waters' Fussy V. of Railway View (A.I.S.) ..	133·5	5·1486	2·5743
J. Phillips's Evelyn of Sunny View (A.I.S.)	149·4	4·9943	2·4971
Cow, three years old and under four, averaging the greatest daily yield of butter fat for 48 hours.			
E. Burton and Sons' Oxford Daffodil (Jersey)	88·9	4·7915	2·3957
S. J. Lester's Susie IV. of Hillfields (A.I.S.)	109·8	4·3480	2·1740
J. H. Wade's Duchess of Wadedale (A.I.S.)	97·6	4·2237	2·1118
Heifer, under three years, averaging the greatest daily yield of butter fat for 48 hours.			
J. Phillips's Melba of Sunny View (A.I.S.)	118·0	3·5519	1·7759
F. O. Hayter's Emma of Spurfield (A.I.S.)	96·6	3·4739	1·7369
A. Pickel's Stella of Blacklands (A.I.S.)	102·3	3·4334	1·7167

MILKING TESTS—*continued.*

Jersey cow or heifer, any age, averaging the greatest daily yield of butter fat for 48 hours.

	Total Milk.	Total Butter Fat.	Average Butter Fat
E. Burton and Sons' Oxford Daffodil	88·9	4·7915	2·3957
J. Williams' Carlyle Pamela	87·4	4·2493	2·1246
J. Hunter and Sons' Pine View Buttercup	78·5	4·0938	2·0469

Dairy Cow, any age, producing greatest quantity of butter fat in 273 days test—

J. Collin's Duchess of Calton (Jersey), 634 lb. of butter fat.

Cow, yielding the greatest quantity of milk in 48 hours:—

J. Phillips's Evelyn of Sunny View (A.I.S.), 149.4 lb.

B. O'Connor's Rosette of Wilga Vale (A.I.S.), 141.9 lb.

A. T. Waters's Fussy V. of Railway View (A.I.S.), 133.5 lb.

Royal National Champion Butter Fat Test, cow or heifer (pure bred), averaging greatest daily yield of butter fat for 48 hours, lactation points being conceded. First prize, £5 and champion ribbon.

B. O'Connor's Rosette of Wilga Vale (.A.I.S.), 46.55 points (champion).

A. T. Waters's Fussy V. of Railway View (A.I.S.), 46.09 points (reserve champion).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of Years' Records.	July, 1930.	July, 1929.		July.	No. of Years' Records.	July, 1930.	July, 1929.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	0·98	29	1·89	0·52	Nambour	2·70	34	1·60	0·30
Cairns	1·56	48	2·95	0 46	Nanango	1·67	48	1.51	0·25
Cardwell	1·36	58	1·29	0·18	Rockhampton ..	1·42	43	1·26	..
Cooktown	0·98	54	0·99	0·54	Woodford	2·36	43	2·00	0·38
Herberton	0·78	43	1·16	0·29					
Ingham	1·51	38	1·09	0·50					
Innisfail	4·66	49	5·84	1·49					
Mossman	1·31	17	0·70	0·03	*Darling Downs.*				
Townsville	0·63	59	0·31	0·06					
					Dalby	1·71	60	3·02	0·57
					Emu Vale	1·54	34	1·49	0·57
Central Coast.					Jimbour	1·55	42	1·60	0·35
					Miles	1·64	45	1·12	0·39
Ayr	0·70	43	0·18	..	Stanthorpe	2·03	57	1.93	1·11
Bowen	0·92	59	0·20	0·06	Toowoomba ..	2·02	58	2·55	0·69
Charters Towers ..	0·64	48	0·08	..	Warwick	1·80	65	2·99	0 76
Mackay	1·65	59	0·30	0·22					
Proserpine	1·31	27	3·10	0·05					
St. Lawrence.. ..	1·28	59	0·60	0·02	*Maranoa.*				
					Roma	1·43	56	1·28	0·19
South Coast.									
Biggenden	1·34	31	1·41	0·12					
Bundaberg	1·81	47	1·32	0·04	*State Farms, &c.*				
Brisbane	2·23	79	1·25	0·53					
Caboolture	2·16	43	1·56	0·32	Bungeworgorai ..	1·34	16	0.90	0·06
Childers	1·68	35	1·70	0·04	Gatton College ..	1·32	31	0.96	0·65
Crohamhurst ..	2·87	37	3·33	0·32	Gindie	0·92	31	0·55	..
Esk	1·96	43	2·43	1·19	Hermitage	1·68	24	2·08	0·76
Gayndah	1·45	59	0·86	0·05	Kairi	1·16	16	1·52	0·45
Gympie	2·14	60	1·54	0·55	Mackay Sugar Experiment Station ..	1·42	33	..	0 16
Kilkivan	1·62	51	1·40	0·39	Warren	1·12	15	..	...
Maryborough .	1·88	58	0·96	0·03					

GEORGE G. BOND, Divisional Meteorologist.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does a vast amount of labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

A SOUND knowledge of the business of pig raising and a liking for the job are attributes without which success would not be possible. Absolute cleanliness in all operations and the realisation that the business cannot possibly prove profitable unless conducted along correct lines, indicates a line of thought along which we work in discussing prevention and in dealing in detail with the different conditions as they arise. The provision of suitable accommodation for all the animals kept, and a regular and efficient food and water supply are the initial requirements, nor would it be safe to suggest entry into the industry unless these be arranged for. Equally necessary are foundation animals from healthy, well-developed stock of strains noted for prolificacy, rapid growth, and suitability for market requirements. Suitable stock are, in most instances, readily available at comparatively low rates, and, even where these cannot be secured locally, they can be selected from reputable herds in clean districts, and be safely transported at a minimum of cost. The provision of one or two "hospital" pens, into which newly purchased stock may be placed for a few days, and to which stock may be transferred when noted to be "off colour," are advised; such pens are an

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

immense advantage and a necessity, and their provision should not be looked upon as merely the fad of a theorist, for in the stock world hospital accommodation is just as essential as it is in the world of human beings, especially where a large number of animals are kept and where the area available for grazing is limited. These pens should be kept in readiness at all times and be in an hygienic condition and capable of being kept clean.

The provision of a supply of the commoner drugs, castor oil, Epsom salts, &c., is certainly essential, especially in centres where it is inconvenient to secure these as required, at short notice. The pig is such a bad patient that, when he is sick, he is down and out and cares but little whether he lives or dies, hence immediate attention is necessary once it is noticed he is off tucker and out of sorts. Much patience is necessary in attending to sick pigs and it is urged that the owner or attendant should be as reasonable as possible in handling the patient. It is not always correct to assume that "the back of the farm axe" is the best remedy if the pig shows signs of ill health.

The Incidence of Disease.

The incidence of disease in pigs may be reasonably grouped under the following headings, all of which have a direct bearing upon the general care, breeding, feeding, and management of this class of stock —i.e., ailments and diseases may be due to or exaggerated by—

(1) Dietetic causes (neglected feeding, impure or unsuitable foods).
(2) Hygienic causes (filthy sties, low-lying, damp, and badly drained areas).
(3) Parasitic infestation (lice, worms).
(4) Constitutional weakness (predisposing stock to ill health).
(5) Hereditary predisposition (particularly in abnormalities of the sexual organs).
(6) Local causes (accidents, bruising, malformations).
(7) Diseases due to specific organisms or the products of germ life (fevers, poisoning).
(8) Unknown or unspecified causes.

As to which (one or more) of these causes would be the responsible one in the case of any particular disease would probably be difficult to decide upon, but in almost every instance the occurrence of disease indicates neglect in one form or other for, where healthy, well-developed stock are kept under conditions favourable to development, disease is not likely to take toll, nor is there other than an ordinary business risk in so far as finances are concerned.

INDICATIONS OF ILL HEALTH.

Ante-mortem Inspection.

To the experienced eye, it is not difficult to determine when an animal is sick or when ill health is developing, but to the inexperienced farmer ante-mortem inspection is quite a difficult job. It is equally difficult to determine with any degree of accuracy the possible cause. Taking the temperature of the animal, recording the pulse and making other necessary observations is equally difficult, especially as this part of the business requires detailed attention, but when the powers of

observation have been developed, it is not necessarily difficult, and one soon learns whether an animal requires medicine or other forms of treatment. Usually the first indication of an abnormal condition is that the animal has no desire for food, he is "off tucker," but has an abnormal thirst and is inclined to hide away in the corner of the yard, either under cover of straw, grass, or exposed to the elements. Such an animal appears depressed, dull and tired, the head hangs limp, the back is arched, the tail hangs lifeless, he moves painfully, if at all, and takes little or no notice of other stock or of his attendants. The hair, which is ordinarily glossy, appears rough and staring, standing on end as the animal arches the back and drops the head; the skin is hot, dry, and there may be unusual tightness (hidebound). The bowels are invariably affected early in the attack and constipation or diarrhœa may be noted, the urine is scanty, yellowish, and evil smelling. The bodily temperature varies, in fevers it is high, in some disorders it is variable and below normal (102·6 deg. Fahr.). The pulse is either rapid or very faint, the breathing is short, jerky. painful or rapid, while coughing or difficult breathing may be a feature; the nose is hot and dry, and lacks the characteristic beads of healthy perspiration; there may be whitish discharges from the nostrils and eyes, a frothy discharge from the mouth or unnatural discharges from the bowels, bladder, or sexual organs. Dry greyish scurf or scales may form around the eyes as a result of a discharge therefrom, while in diseases of the eye, there may be a sticky discharge, and the eyelids may even become partially glued together, especially after the evening's rest. An irritating cough and heavy breathing indicates affections of the lungs and bronchial tubes. Paleness and inflammation of the mucous membranes of the eyes, nostrils, mouth, and other external openings indicates an anæmic condition, while a distinctly yellowish appearance of these membranes indicates disorders of the liver (jaundice).

Where injuries are responsible for the ailment it is possible examination may indicate inflammation, abscess formation, discharge of pus, growth of proud flesh, fractures, lacerations, or other abnormal conditions with resultant difficulty of movement (stiffness). In diseases of the mammary glands (udders) there may be inflammation and the parts may feel hot and very hard to the touch, or there may be local irritaton and inflammation as in cow pox, or bleeding or the formation of scales where the teats or udders have been lacerated. Dropsical conditions are indicated by extreme obesity with loss of condition, bowel disorders by extreme difficulty in passing the fæces, or by profuse diarrhœa, &c. There are other conditions too, referred to in dealing with individual diseases like paralysis, rickets, in which the limbs are affected and the animal is unable to move about freely.

Post-mortem Examination.

The indications of disease found on an examination of the carcass or viscera (internal organs) after death vary considerably with the nature of the ailments or disease, hence, to become more conversant with these conditions, the farmer should make every effort to study the subject and gain as much practical experience as possible by visiting bacon factories or slaughtering establishments, and noting the condition of the various carcasses and of the viscera, both healthy and diseased. Diseases like tuberculosis (T.B.) are difficult to locate in pigs on ante-mortem inspection, but are usually readily located by the meat inspector

on post-mortem examination. It is these diseases in which there are practically no external symptoms that puzzle the farmer and cause him to doubt the experience or the integrity of the meat inspector or the fairness of the system requiring condemnation in part or whole of infected carcasses or organs, especially as such condemnations are relatively common and are a matter of practically everyday experience on the part of meat inspectors in large slaughtering establishments. It might be mentioned here, too, that occasionally the inspectors classify as boar meat the carcasses of male pigs in which internal testicles are found. In many cases the farmer claims that the pig was properly castrated, but if the inspector finds one or both testicles located internally, or castration improperly carried out, he has no option (except in the case of pigs less than four months old) but to classify the meat as that of a boar pig for which a lower price is paid.

ISOLATION AND TREATMENT OF SICKLY PIGS.

The first step to take when it is noted that pigs are ailing or are sick is to separate them from the rest of the herd and place them in a comfortable, well-lighted, and well-ventilated pen, or in a yard in which there is a good, clean, and dry shelter shed, free from draughts. For convenience sake this is referred to as a hospital pen. Having separated the patients, next make sure that the bowels are in good working order and that the urine is passed freely and without indications of pain. It is urgent that this be done, for most of the diseases to which the pig is subject are exaggerated by bowel disorders and kidney troubles.

A liberal dose of Epsom salts is one of the best preliminaries in treatment, though it is very difficult to find any better than the good old castor oil with which our parents immediately dosed us as soon as we showed any indication of ill health. In the case of the pig the doses should vary from 1 to 4 oz. of Epsom salts, and from one to four tablespoonfuls of castor oil, the smaller dose being for pigs up to three months old with larger doses for stock carrying more age.

Having taken these steps and having seen to the animals' temporary wellbeing, the next step is to set about improving the conditions under which the remainder of the stock are kept; trying to discover the cause of the illness and to make the necessary arrangements for care and treatment of the sick animals.

No "Cure-alls."

One thing it is desirable to remember is that there are no specific "cure-alls" for the diseases of the pig. The most satisfactory remedy is prevention through strictly observing and regularly practising the rules of health. It may seem irksome to be continually cleaning sties and giving detailed attention to the feeding of pigs, but those who are most successful in this business take much greater delight in preventing disease, by following correct methods of management, than they do by the administration of medicine or other forms of treatment. The compulsory drenching of a sick pig is one of the most unpleasant jobs on the farm.

Preventive measures often entail the use of medicines such as castor oil, but this is best given in the food, especially with sows due to farrow or to stock that have been crated up for several days during long railway

or steamship journeys and who need freshening up as a preliminary to taking up life under a new environment. Drenching by force should be avoided at all times if possible, since it does not improve the temperament of a sick pig, and especially in diseases of the lungs or respiratory passages is distinctly dangerous. In using castor oil the best grades only should be used; other oils such as raw linseed oil, and drugs such as Epsom salts, pig powders, &c., may also be added to the food if the pig has not lost his appetite.

It is preferable to give such medicines in the first feed of the day, while the animal is still very hungry.

THE ADMINISTRATION OF MEDICINE TO PIGS.

How to Use Castor Oil.

To prepare castor oil for use, proceed as follows:—(1) Secure one or two dippers of wheaten bran (for preference), or pollard, cereal meal, or waste bread crumbled up; place in a clean bucket; now measure out the amount of oil to be given and pour it into the dry bran or meal, mix thoroughly, and then, using milk or warm skim milk, reduce the mixture to the consistency of thick cream. Add just enough table salt (say, half a teaspoonful) to disguise the taste of the oil and give with the mash. Compel the animal to take vigorous exercise three or four hours after being dosed, and the result will invariably be satisfactory. Allow ample clean drinking water.

Many medicines can be administered in this fashion, and some others, such as sweet spirits of nitre, may to advantage be added to the drinking water.

Where, however, the state of an animal is such as to make compulsory dosing necessary, it should not be shirked, and the drenching bit or drenching horn (a cow's horn suitably prepared makes a good one) comes into play. Two warnings are necessary here: Drenching apparatus must be scrupulously clean and—never persist in giving a drench to an animal when it is obviously unable to swallow freely. Furthermore, no attempt should be made to drench a pig suffering from diseases of the respiratory passages or lungs, such as bronchitis, pleurisy, &c., since in these diseases the respiratory passages are inflamed and very tender, and if the liquid penetrates into the bronchial tubes serious complications will probably result.

In any case, when an animal is given a drench it must be properly restrained preferably with a strong rope or piece of webbing placed in its mouth behind the tusks and over the snout, the rope being secured to a stout post or rail in such a position that the head can be lifted or lowered in a moment if required.

Do not be in a hurry while drenching. Give ample time for the animal to swallow every mouthful and lower the head at once if there is any indication of coughing or choking.

If the animal weighs less than 100 lb., an attendant, lifting and straddling the animal's back and at the same time grasping both his forelegs, should raise the pig's head high enough to allow the drenching horn to be placed in position. Take plenty of time and give the animal a chance to rest.

At the same time, the animal should be "gagged" by placing a small piece of soft wood between its upper and lower jaw, thus allowing room for a tube or horn to be passed into the mouth. Use a piece of wood not less than 6 inches in length and be sure it is clean and free from splinters.

It is advisable to use a horn with fluids. When a powder has to be given the best method is to make it into a ball with honey or treacle, and if necessary flour. Then using a fairly long piece of wood or a ladle, deposit the mixture on the back of the tongue. If it is placed further forward in the mouth it will almost certainly not be swallowed. Some medicines may be given in pill form.

Pig Powders, Proprietary Medicines, &c.

The author is often asked if he recommends the use of well-advertised pig powders and medicines, salt and bone licks, &c. The answer is invariably that there is no doubt many of these (especially those of long standing and well-established reputation) possess to a greater or lesser extent some healing power and are of value when judiciously used. Some, like salt and bone licks, are very necessary and are certainly recommended, but medicines are quite valueless unless their use is accompanied by a thorough clean-up of the pig premises and by improved methods of accommodating, feeding, and caring for the pigs, and even more important still by strictly culling out all unsatisfactory animals, followed by the introduction of stock carrying better breeding and stronger disease-resisting powers. Stock of low vitality and with weak constitutions are prone to all sorts of trouble and should not be retained on the farm.

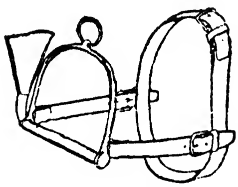


PLATE 83.

FIG. 1.—A suitable type of Pig Drenching Bit of special value to the breeder of valuable pigs. The bit is inserted in the pig's mouth, and the straps are passed round the head at the back of the ears. It simplifies drenching.

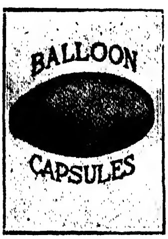


PLATE 84 (Fig. 2)—WORM CAPSULE READY FOR USE.

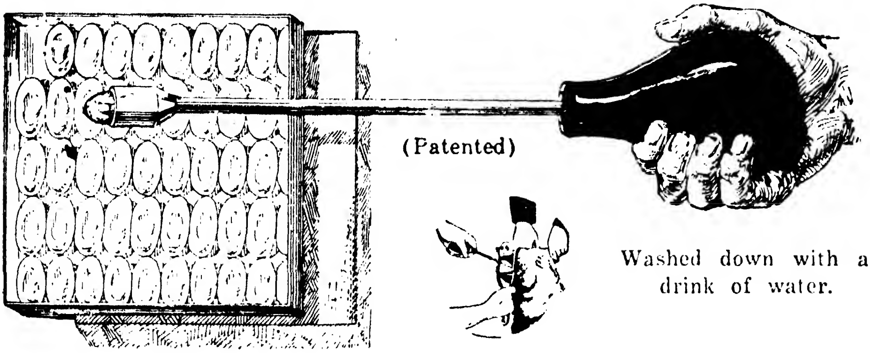


Plate 85 (Fig. 3).—Worm Capsule Outfit.
(Showing patent metal instrument for use in administering capsule, the jaw opener, and box of capsules).

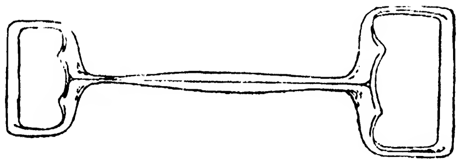


Plate 86.

Fig. 4.—A convenient instrument for inserting into the pig's mouth in order to hold the animal while being drenched or treated. This is a very strong instrument, enabling the operator to handle a heavy sow or boar with comparative ease.

Worm Capsules. (Figs. 1, 2, 3, 4.)

Worm capsules such as are advertised in the Agricultural Press, should contain a full dose of vermifuge (worm medicine) like oil of Chenopodium, Santonin, &c., inside a transparent gelatine covering (the capsule). The special advantages of these capsules are that they are both simple and efficacious if administered correctly. Each capsule carries a stated dose and each pig must be treated separately; thus each pig stands so much better chance of being freed from intestinal parasites. The capsules are usually prepared for animals of varying weights, thus one capsule for a pig weighing 50 lb., two for a pig weighing 100 lb., &c. Repeat doses may also be necessary. Doubtless as time goes on the use of worm capsules will become more general, provided their quality be guaranteed. Some manufacturers supply instruments for use in administering the capsules. Provided the capsules are reasonably priced and of the quality stated, it would be preferable for the inexperienced to depend on them than to attempt drenching an animal about which job they had considerable doubt, especially as capsules may be given in the food. It would, however, be well to obtain Departmental advice before using any remedies of which the farmer has had no previous knowledge.

If the pigs are properly fed and cared for and have ample nutritious food, including greenstuff, there should be no need for the extensive use of pig powders, oils, and similar medicines, but where pigs are sickly and are not doing well and improved feeding and care are not immediately effective, the use of pig powders may be beneficial. It is not difficult to obtain Departmental advice on these matters.

Drugs having as their objective the stimulation of the sexual organs should be used with the greatest caution, and may also be effective in freshening up lethargic animals, but in no instance should dependence be made on the use of sexual stimulants; because healthy, vigorous, well-developed stock should not be in need of artificial stimulants except perhaps during abnormal periods.

Use of Hypodermic Syringe.

Some drugs must necessarily be given with a hypodermic syringe. In muscular and nerve tissue diseases and snakebite where a quick acting drug is called for, it is preferable to have a drug given in this way, but in these cases a qualified official should be engaged to do the work, for an overdose of these specifics is fatal.

Vaccination.

Fortunately pigs in this part of the world are not troubled much with diseases controlled by vaccination and the use of hog cholera serums, mixed infection serums and viruses. The diseases which call for this form of medication include hog cholera or swine fever, swine plague, swine erisipelas, anthrax, foot and mouth disease, and rinder-pest. In America, Europe, and parts of the United Kingdom, vaccination appears to have become an absolute necessity.

However, no attempt should be made here to inject serums into pigs unless under strictly official instructions from the State veterinary authorities. It is advisable wherever the owner is doubtful about the nature of the disease from which his animals are suffering, that he should immediately seek the advice of the State officers. With more serious diseases, he is liable to a heavy penalty if he neglects to notify them. Information regarding the nature of various diseases may be had on application to the officers referred to.

Regulations are very strict in all States, so strict as to be regarded by many as irksome; but if the greatest critics of our system could visualise where laxness has led the pig industry in other countries, their criticism would most certainly cease. Rigid supervison has kept us free of most of the ills which afflict stock in other countries. Information as to the regulations controlling import and export of pigs is also available upon application, and should be obtained by all interested in the transport of pigs from one State or country to another.

Rectal Injections.

The enema is often used in the treatment of pigs suffering from acute constipation, stoppage of the bowels, diarrhœa, or other bowel affections. The injection usually consists of warm soapy water to which some form of oil—olive, lucca, salad, or glycerine—has been added. No irritating drugs whatever must be given in this way, otherwise the bowel tissue will be injured. Irrigation of the uterus of breeding sows for diseases of that organ is also to be recommended in certain conditions.

Fumigation.

Here again, where eucalyptus, chloroform, and other drugs are to be introduced through the air passages, it is advisable that veterinarians with a knowledge of the technique of the work be employed.

External Remedies.

These are necessary in the treatment of skin diseases or injuries or for the purpose of freeing the skin of lice or other skin parasites. Spraying is to be recommended in place of dipping if the number of animals to be treated suggests some other form than hand treatment, for wholesale dipping of pigs is by no means an easy task. Dusting with insecticide is well worth consideration, especially with very young pigs. The use of an oiling post to which the animals may go for relief is advised.

PARASITIC INFESTATION.

Internal Parasites of the Pig.

It is essential that the pig breeder should have some knowledge of the various external and internal parasites that infest his stock, and, in this connection, intestinal worms are the most prevalent of those located internally with which he will have to deal.

A prominent overseas author recently stated that more pigs die of intestinal parasites than from contagious diseases. He added that worms cause 90 per cent. of the losses in live stock.

Results of Infestation.

Pigs infested with worms are in just as serious a condition as if affected with contagious disease, though results may not be so apparent or fatal.

Mal-assimilation, debility, &c., from whatever cause it arises, weakens the animal's resistant powers, and makes it a fit subject for attack by internal or external parasites. Animals with sturdy vigorous constitutions are better able to withstand the evil consequences of parasitic infestation than stock less favoured in this respect, the parasites seeming to find their most suitable environment in weakly hosts, this, probably, on account of general debility exercising a depressing influence on the various protective agencies whose function it is to protect the body against infection. Loss of tone in the bowel muscle, by causing constipation, and the retention of poisonous matters in the intestines, also favours parasitic infection; healthy active movement of bowels being opposed to the habits of parasites.

Symptoms of Worm Infestation.

Worms will stunt the growth of the animal, no matter how good the food and care. Though the pig may have a good appetite and eat well, he will, if heavily infested with worms, fail to make headway; his growth will be checked, he will lose flesh, his appetite will become capricious, his skin hidebound and dry and the scurf will flake off in large patches. There may also be a deep "stomach" cough. The animal will rub himself constantly against fences, tree stumps, &c., he will back up and rub his hindquarters against the food troughs, his back will become arched, his flanks tucked up, the nose will be dry and hot, and the eyes glazed, and the throat will be enlarged and "bottle-necked."

Effects on the Pig.

As the disease advances and the parasites become more numerous, the belly will become podgy, the skin hanging over the bones in a dry, tight fashion, and the animal will be inclined to lie in a corner and to

lose heart altogether, he will become anæmic, the mucous membranes will be pale and dull; the bowels are inactive, and sickness gradually overtakes the weakened animal; there may be convulsive pains and colic and finally emaciation may set in, very often with fatal consequences.

The effects of internal parasites on the animal naturally depend upon several factors. The number present is important; in most cases a few parasites in an animal cause no appreciable harm. The age of the pig is another factor influencing the effects of infestation. Intestinal worms cause much more harm to young pigs than to healthy mature animals, and similarly they have greater effect upon stock weakened by lack of suitable foods and vitamines, or by general ill health, or accident. The nature of the food that is given is very important; pigs fed on pasteurised skim milk and similar nourishing foods resist infestation much more readily than offal-fed pigs, or pigs fed largely on dry, fibrous foods.

The manner in which the animal is fed, attended to, and housed, and the amount of green, succulent food he has, are all important factors influencing the resistant powers.

Preventive Measures and Treatment.

In general, to prevent infestation by parasites, the following points should be considered:—

(1) The pigs should be kept growing. The better they are handled and fed the more likely they are to avoid and throw off infestation. Give the young pigs a good start. Old pigs do not apparently suffer much from intestinal worms, but even the old pigs should be well fed and carefully managed so as to keep them in good thrifty condition. Older stock are more subject to infestation by kidney worms than by stomach or intestinal parasites.

(2) Correct feeding of the young pigs may be simplified by arranging separate feeding places so that they can feed apart from the sows. In these places such feed as grain (cracked and boiled or soaked for very young pigs), meat meal, pollard, &c., should be placed, and for preference, each in separate troughs. If these pigs are allowed out on pasture, so much the better, preferably on lucerne, clover, or succulent grasses; skim milk is a valuable addition to the list of foods, and to avoid infection by germs of tuberculosis, the milk should be pasteurised before use.

(3) Free access to charcoal, wood ashes, air-slacked lime, rock salt, may be allowed, these being given "free-choice style," preferably mixed in the form of a mineral mixture and kept in a separate trough, well protected from weather.

(4) Clean pastures and roomy pig paddocks are important. Pastures—grasses and other herbage—are useful, good green lucerne and clover pastures are even better. Succulent pastures are always appreciated, hence the advantages of numerous small paddocks in preference to one or two larger areas.

Ploughing up the old pastures helps wonderfully in getting rid of parasite infestation. Taking the pigs away from the old infected areas and placing them on new pastures and in new pens is to be recommended. Keep the pigs away from infected marshes, slow-running creeks, and stagnant pools.

The provision of a properly constructed concrete bath is a payable proposition. Use some sheep dip or crude oil now and then in this bath.

(5) Do not throw green food out in the mud or on dirty floors. Have a concrete feeding platform and feed them there; keep this platform clean so that the pigs will not pick up infection from dirt; keep the troughs and feeding places free from mud, corn cores, refuse, &c. Use feeding racks for greenstuff.

(6) At all costs avoid using the milk of cows that are suffering from simple or contagious abortion, as it is possible this infected milk may be a primary cause of outbreaks of abortion among breeding sows. All in-pig sows, and particularly those that are heavy in pig, should be carefully housed, as an extra severe frost or a change to cold squally weather may induce abortion. It is believed it often does. The use of musty, mouldy foods and of weak, washy swill is decidedly dangerous.

(7) Drainage is necessary. Keep the pens as dry as possible. Diseases and parasites are always more plentiful in wet seasons and on low swampy areas of ground than on high and dry building sites or in dry, hot seasons.

(8) The life history of parasites should be studied. Study schemes that will evade the worm, the worm eggs, and the embryos at all stages in their life hstory.

(9) Use properly compounded worm remedies; Santonin and calomel are good. The dose is about 5 grains of each to a 100 lb. weight pig. For a 200 lb. pig increase to 7½ grains, and for a 300 lb. pig 5 to 10 grains of each of these drugs. This is called an emergency treatment, and may be given to wormy pigs with advantage.

(10) Feed lightly for two days following, then give a good purge of 3 to 4 oz. of castor oil. Repeat in a fortnight if the animal has not improved on good feeding. The doses given are for a full-grown pig; if treating a baconer or a porker, give about two-thirds of a dose to each animal.

(11) An American recipe which has proved very successful is as follows:—Mix together Santonin, 5 grains; areca nut, 3 drachms; calomel, 3 grains; sodium bicarbonate, 1 drachm. The ingredients should be thoroughly mixed. The quantity named constitutes a dose for a 100-lb. pig. Use twice as much for a 200-lb. pig, slightly more for a 300-lb. pig. Feed should be withheld for at least eighteen hours before giving the above mixture, which should be mixed in a small mass of pollard or else as a drench in warm milk. Repeat the dose in eight to ten days to make sure that all worms are expelled.

(12) Another useful farm recipe is:—Turpentine, half to one tablespoonful; linseed oil (raw), two to four tablespoonfuls. Mix well together, and give as a drench in a small quantity of milk, and follow with a dose of castor oil, this for a full-grown pig, half this quantity for a pig of bacon size.

(13) Powdered areca nut given in the same way in 1½ to 2 drachms doses is also very good. See also references to the use of worm capsules in the paragraphs dealing with administration of medicine to pigs.

INTESTINAL WORMS.*

Internal parasites of the pig that have so far been recorded from Australia may be classed as follows:—

Intestinal Worms.

Ascaris lumbricoides (Lin.). The Long White Worm.

Ancylostoma duodenale (Dub.). Hookworm.

Necator americanus (Stiles). Hookworm.

Macracanthorhynchus hirudenaceus (Pallas). Thorn-headed Worm.

Oesophagostomum dentatum (Rud.). Nodule Worm.

Oesophagostomum longicaudum (Goodey).

Trichuris trichiura (Lin.). Whip Worm.

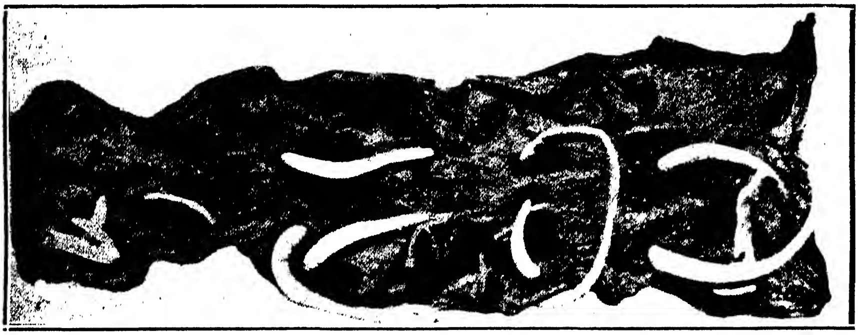


PLATE 87.

Fig. 5.—Portion of pig's intestine, showing Thorn Headed Worms attached to the mucous membrane of the intestines. The worms illustrated were much shrivelled and immature when this photograph was taken.

Stomach Worms.

Arduenna strongylina (Rud.).

Physocephalus sexalatus (Molin).

Hyostrongylus rubidus (Hassal and Stiles).

Gnathostoma hispidum (Fedch).

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* The author is indebted to Mr. F. H. S. Roberts, M.Sc., Veterinary Parasitologist, for a revision of this section of the Diseases pamphlet, also for supplying the names of the various pig parasites.

The illustrations (Plate 88, Figs. 1-2, Plate 89, Figs. 1-5*b*) are the work of Mr. I. W. Helmsing, Illustrator, also of the Entomological Branch, Department of Agriculture and Stock, Brisbane, Queensland.

Lung Worms and Worms Infesting Other Organs.

Metastrongylus apris (Gmelin). (Lungs.)

Chaerostrongylus pudendotectus (Wost). (Lungs.)

Echinococcus granulosus (Botsch). (Lungs, liver, &c) Hydatids.

Cysticercus tennuicollis (Omenta and mesenteries). Water-ball.

Stephanurus dentatus (Dies). (Perirenal tissue, liver, and lungs.) Kidney Worm.

Fasciola hepatica (Lin.). (Liver.) Liver Fluke.

Thus of the fifty-two internal parasites recorded by Baylis as being found in the pig, seventeen have been found in Australia. The most plentiful parasite appears to be the kndney worm, *Stephanurus dentatus*. The percentage of infestation by *Ascaris lumbricoides* is also fairly high, whilst that of the thorn-headed worm, *Macracanthorthynchus hirudinaceus*, and the stomach worms, *Arduenna strongylina* and *Physocephalus sexalatus*, appear, from the information available, to be slowly increasing. The lung worms and whip worms (*M. apris*, *C. pudendotectus*, and *T. trichiura*) are somewhat rare, whilst the nodule worms *Oesophagostomum* sp. in the pig have yet to be encountered in this State. Australia is fortunate in that the intestinal parasite *Trichinella spiralis* is as yet unknown here. This worm is the cause of that serious disease "Trichinosis." Another worm whose infestations are very common abroad and unknown in Australia is the *Cysticercus cellulosa*, the cause of pig measle.

The Long White Worm.

(See Plate 88, fig. 1.)

The common round white worms (*Ascaris lumbricoides* (Lin.) are found in nearly all pigs, and occasionally are present in such numbers that portions of the intestines are choked with them as they lie bunched together. They prefer to live in the small intestines, but may also be found in the large bowel, the stomach, the bile ducts, while they have even been found in the œsophagus (the food pipe carrying the food from the mouth to the stomach).

These worms are round in shape, tapering at both ends, are white or yellowish in colour, and have a smooth clear skin. The female is the larger, and is 9 to 15 inches in length; the male is shorter and stouter, and measures 4 to 9 inches in length.

The life history of the Ascaris is now known to be very complicated. The eggs must pass from the body of pig and after passing, if conditions of temperature, moisture, &c., are favourable, hatch in from ten to fourteen days. The young larvæ are swallowed with food, water, &c., and in the case of young pigs from the teats of the mother infected with worm eggs from being in contact with the infected soil of pen. They reach the intestines, make their way into blood vessels, and are carried to lungs. Here further development proceeds until the young worm is coughed up and swallowed, reaching intestines again where they grow to maturity. It is worth stressing that there is grave danger of the young pig becoming infected by sucking the teats of a sow whose udders might be covered with eggs and larvæ picked up in dirty pens.

The worm eggs may be distributed in shallow pools, water troughs, or in old straw heaps; it is safe to say that every pig more than a few days old may thus become infested if worms exist in the herd.

Strict sanitation and immediate attention to the treatment of all affected pigs is strongly advised.

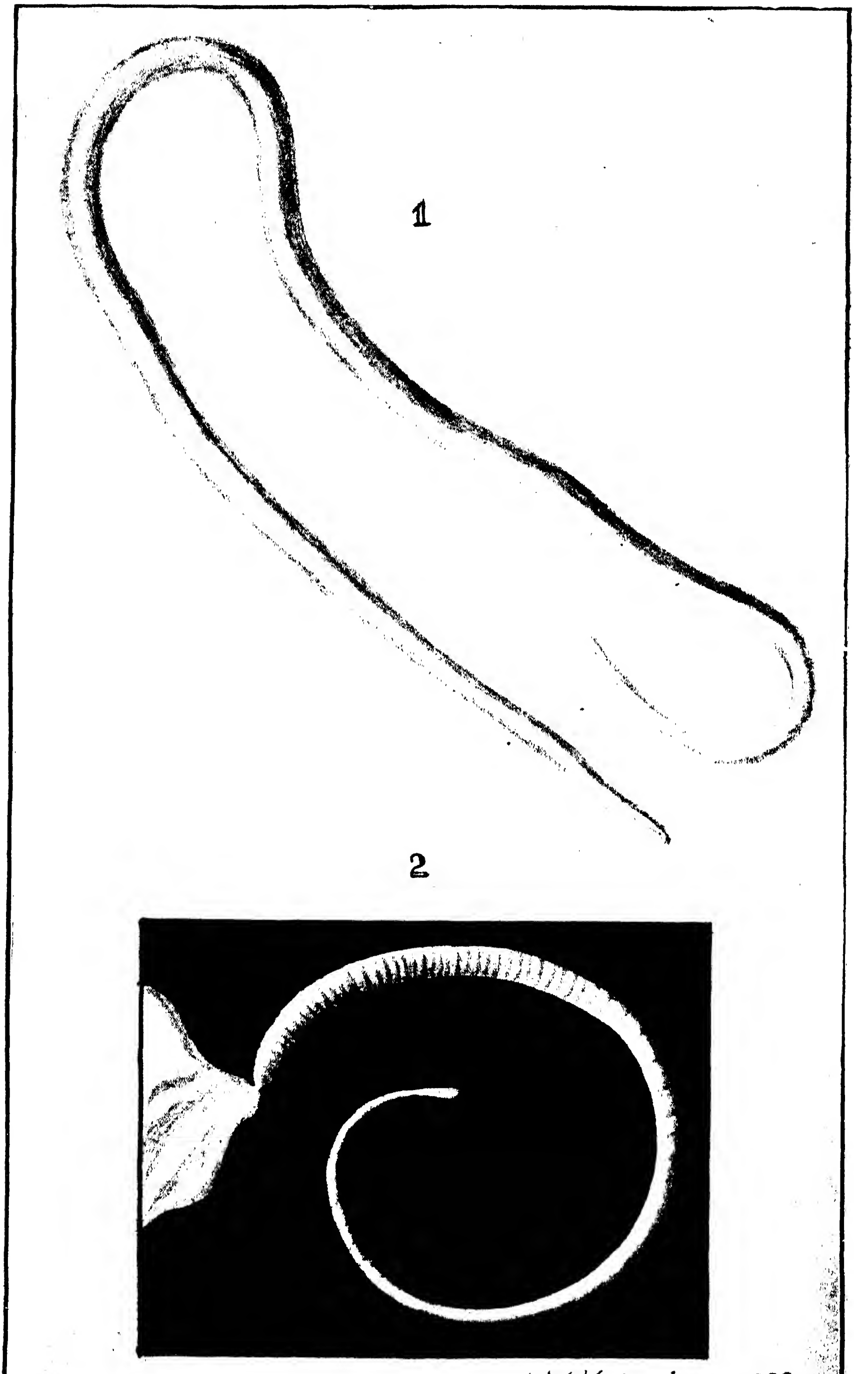

PLATE 88.

Fig. 1.—Long Round White Worm (*Ascaris lumbricoides*), natural size.
Fig. 2.—Thorn-headed Worm (*Macraeanthorthynchus hirudinaceus*), natural size.

The Thorn-headed Worm.

(See Plate 88, fig. 2.)

This is also an intestinal worm usually found in the small intestines of pigs. Sometimes it is also found in the large intestines. It is quite frequently found associated with round worms, but usually, in Queensland, only a few thorn-headed worms are found in infested animals. They are a round worm, but are more slender and usually shorter than the Ascaris, and are milky white in colour.

These worms have a powerful armed proboscis with which they fasten themselves to the intestines. They do not suck the blood, but take their food directly from the intestinal contents.

The female lays her eggs in the intestinal tract where they become mixed with the contents and are then passed out with the fæces. These eggs are too small to be seen with the naked eye. The next stage in their life history is when they are swallowed by a species of beetle or its larvæ frequenting the manure of the animal. A few days following this, these eggs hatch out in the digestive tract of the insect and then find their way to the abdominal cavity. The pig in rooting about finds these insects and eats them. Thus the parasites find their way into the stomach of the pig, where they are released by digestive processes and are soon fully mature. These worms do considerable damage when present in large numbers, for they burrow into the intestinal wall where they produce inflammation, and in some instances have been known to produce abscesses and perforation of the bowels. The worms do not remain attached to one place very long, but move about in the intestinal tract, causing a number of inflammatory areas.

When these worms are present in considerable numbers the animal suffers from general unthriftiness, loses weight, has an irregular appetite, and may be constipated at first, suffering later from diarrhœa. The animal may show signs of nervousness, and the muscles of the head and neck may jerk or twitch; at this stage convulsions may take place, and if so, the animal usually dies.

The only way to deal with these worms is to prevent infestation by keeping the pigs on areas that are not infested with these beetles and their white grubs; these are frequently found in old manure piles and in decaying timber and rubbish. General sanitary measures are strongly recommended. The same treatment is recommended for prevention of long white worms. No worm medicine should be given unless the animal has been fasted for at least eighteen to twenty-four hours; this allows the medicine to work on an empty stomach and in an intestinal tract not overloaded with food. Medicinal treatment is not likely to be as effective in the case of thorn-headed worms as it is where *Ascaris lumbricoides* is present alone.

In addition to the preventive measures referred to above, it is suggested as a further means of preventing infection that sows about to farrow be placed in a clean pen. Young pigs born under these conditions have a better chance of keeping free of infection during their early growth when heavy worm infestation may have fatal results.

The Lung Worms.

The lung worms (*Metastrongylus apri* and *Chaerostrongylus pudendotectus*) are not as common in pigs in this country as abroad, though they are occasionally found and are probably spreading into new districts

every year. They infest the bronchial tubes and air passages which abound in the lungs, and are a source of much irritation and annoyance to the affected pig.

The lung worm is a delicate white or brownish coloured thread-like worm, in length from one and a-quarter to one and a-half inches. The male is slightly shorter than the female, and the headpiece is provided with a sucking apparatus by means of which it is possible for the worm to cling to the mucous membrane. The entire life history of the lung worm is not well known, but it is evident that the eggs are passed out in the mucous discharges from the nostrils and the mouth; they may also be swallowed by way of the mouth and be passed out in the discharges of the bowels. The eggs often find their way into the ground, where, with sufficient warmth and moisture, they hatch out and are taken into the intestines with food, &c., and from there enter a blood vessel, and eventually find their way to the air passages and lungs. Lung worms are responsible for the disease known as verminous bronchitis.

It is not known how long the eggs may remain dormant or how long the newly-hatched worm can live before an opportunity offers for their being carried back to the air passages of a new host. Pigs infested with lung worms will suffer severely if the worms are present in large numbers, but if only a few are present, they may not be noticed. Young pigs are more likely to suffer than mature animals. Affected pigs usually cough very much after rising in the morning or after taking food or exercise. This cough is the result of irritation of the mucous membrane. Unthriftiness and emaciation would follow if the animal were severely infested. There is no reliable method of treatment, as the pig is not an easy patient when it comes to fumigation by inhalation, hence preventive measures with careful housing and feeding must be relied upon in the battle against lung worms.

Overseas Experience.

In an interesting report on "Some Parasitic Diseases of the Pig," by Professor Basil Buxton, M.A., F.R.C.V.S., in the Pig Breeders' Annual, emphasis is laid on the economic importance of diseases of the pig. Professor Buxton also makes an excellent point when he refers to the drastic measures that are adopted by Government officials in Great Britain, in the case of an unfortunate outbreak of Swine Fever or Swine Erysipelas, while little attention is paid to the more insidious, although equally important, broncho or gastro intestinal parasites.

He adds that the common "Lung Worm" of the pig (*Strongylus paradoxus*, sometimes also referred to there as *Metastrongylus apri*), is responsible in some districts for serious losses among young pigs. The irritation caused by these parasites results in bronchitis and later in pneumonia. The lung worms are whitish or brownish white threadlike parasites, varying in length from one to one and a-half inches. The eggs contain active embryos and these probably hatch in the lungs, and are carried out in the mucus discharged by coughing or may be voided directly or be swallowed and passed out with the fæces. Many pigs are doubtless infected through their drinking water.

Treatment for lung worms is a much more serious business than for intestinal worms; hence competent aid should be called in to handle the case and advise as to the best forms of medications.

The Kidney Worm.

(See Plate 89, figs. 1 and 1a.)

Kidney worms, technically referred to as *Stephanurus dentatus*, Dies. are now one of the most persistent parasites of the pig, though, until recent years, they were comparatively rare and in many parts of Australia were unknown, but during the last twenty years they appear to have spread with surprising rapidity and now scarcely a district could be named in which infected pigs could not be found. The worms are quite characteristic and distinct; being mottled in colour, similar to brown or light tortoiseshell, the male growing to about an inch in length, and the female slightly longer.

The kidney worm makes its habitat in the abdominal viscera, especially in the fatty tissues surrounding the kidneys and in the fatty tissues of the intestines, stomach, liver, and other organs where it may cause abscesses varying in size, and in the pus of which the worms may be found singly or in pairs or more. These abscesses are usually soft and spongy and if the worms are plentiful may be extensively distributed.

Individual pigs do not appear to be infested with any great number of parasites. The affected kidney will be much enlarged; there may be a quantity of creamy pus in the pelvis (or internal cavity of the kidney), or this may have developed into an abscess. The worms will invariably be found in the tissue, and in the case of the ureters* they may be found floating in the pus. In the fatty tissue (the flare or kidney fat) the worms may be numerous and can at once be observed by their peculiar (mottled) colour and form.

There is no other worm infesting the pig that could be mistaken for the kidney worm. It is difficult to understand how they reach their favourite haunts, but their life history shows that the female lays eggs that are passed out in the urine and are thus deposited on the pastures where, under favourable conditions of temperature and moisture, they hatch within twenty to thirty-six hours, and within about a week they reach the infective stage, and are ready to start work in susceptible pigs that might swallow them in food or water. In this way they enter the intestines and eventually reach the kidneys or the fatty tissues surrounding these areas. It is apparent that the eggs and larvae are both susceptible to low temperature and drying. Some authorities state that, on hatching, some of the larvæ are taken in with the food and others bore through the skin, the organs affected being dependent upon the method of infection.

When the deep-seated position in which these worms lie is remembered, it will be seen that treatment is a very difficult matter; in fact, it is impossible to rid the animal of them by direct treatment. Ordinarily there is no way during life of determining when an animal is infested, except by microscopic examination of urine, fæces, or infested soil; and if any symptoms were present that would indicate their presence it would be problematical whether treatment would be of any value. Pig breeders should make a point of striving by strict sanitary methods to keep out parasites of all descriptions and to be extremely careful when buying fresh stock to see that they come from clean herds and are

* The ureter is the duct through which the urine flows from the kidney to the bladder. The urethra is the canal or duct through which the urine flows from the bladder.

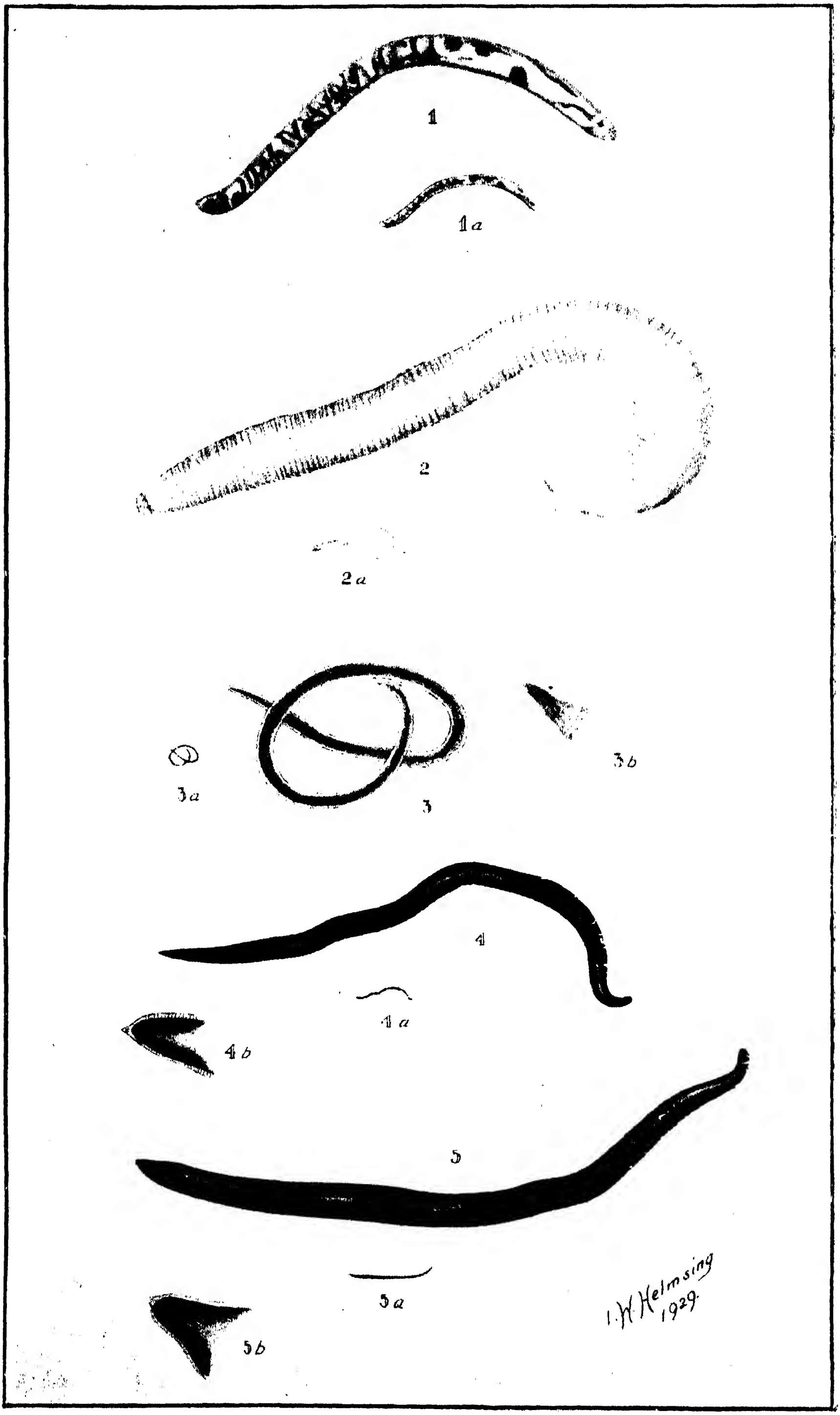

PLATE 89.

isolated from the rest of the pigs for at least three weeks. It must further be remembered that a pig in good condition is better able to resist these parasites than would be the case if poorly fed and attended to.

Kidney worms cause an ever-increasing economic loss in organs or parts thereof condemned, although normal carcasses that are infested are not usually reduced in value, nor are they subject to condemnation by meat inspectors if they are otherwise in marketable condition.

Kidney worms are reputed to be the cause of partial paralysis of the hindquarters of pigs, but this is by no means certain, though a pig infested with kidney worms must suffer a good deal of inconvenience and probably pain, and in this way might be predisposed to conditions responsible for paralysis.

The Whip Worm.

The whip worm (*Trichuris trichiura*) is a tiny, whip-like white worm found in the coecum and colon. In size they vary from one and a-half to two inches. The anterior portion of the body is thin and threadlike and the posterior portion is quite stout. The whip worm buries its long head in the mucosa whilst the heavy body floats freely in the lumen of the large intestine. They feed upon the blood and other nutritious matter absorbed from the spot into which the mouth is buried. The life history is simple, reinfection occurring when the eggs are taken into the stomach. Here they hatch and the young larvae quickly reach the coecum where maturity may be attained in sixteen to twenty days.

This worm is not often found in pigs which are kept in cleanly sanitary surroundings; like the round worm it thrives on farms where there is neglect. The eggs are very resistant and may live for years before losing their vitality. As with the round worm good sanitary conditions are most desirable, as owing to its location, it is very difficult to reach the whip worm with any vermifuge.

Plate 89.

Fig. 1. Kidney Worm, x 2¾.
Fig. 1*a*. Kidney Worm, natural size.
Fig. 2. Hook Worm, x 7.
Fig. 2*a*. Hook Worm, natural size.
Fig. 3. *Arduenna strongylina*, x 8.
Fig. 3*a*. *Arduenna strongylina*, natural size.
Fig. 3*b*. *Arduenna strongylina*, anal extremity.
Fig. 4. *Necator americanus*, x 8.
Fig. 4*a*. *Necator americanus*, natural size.
Fig. 4*b*. *Necator americanus*, anal extremity.
Fig. 5. *Ancylostoma duodenale*, x 8.
Fig. 5*a*. *Ancylostoma duodenale*, natural size.
Fig. 5*b*. *Ancylostoma duodenale*, anal extremity.

ADDITIONAL INTESTINAL PARASITES OF PIGS.

Ancylostoma duodenale Dub. (hookworm). Pl. 89, figs. 4, 4a, and 4b.
Necator americanus Stiles (hookworm). Pl. 89, figs. 5, 5a, and 5b.
Oesophagostomum longicaudum Goodey (nodule worm).
Oesophagostomum dentatum Rud. (nodule worm).

The first and second are the common hookworms of man which were recorded for the first time in Australia by Doctor John Legg, B.V.Sc., M.R.C.V.S., Government Veterinary Surgeon, Townsville, and Mr. J. Rheuben, Slaughtering Inspector, Department of Agriculture and Stock. A further description of these worms with photos will be found in "Neuman's Parasites," second edition, available at leading booksellers.

Hookworm attach themselves to the duodenum of the pig (portion of the intestines) in thousands, and that portion of the bowel being rich in blood vessels it will readily be seen how infestation results in an animal becoming emaciated as these worms feed on the blood. It is not known at present to what extent these parasites infest Australian pigs, for they have not been reported on extensively. Likewise, it is not known whether their presence in pigs results in any serious disorders apart from the condition already described. Doubtless, more will be heard of them in the future as extended research makes it possible to locate more the species. These worms have also been reported on by Dr. Georgina Sweet, Melbourne, Victoria, a noted authority on Animal Parasites.

The two species of *Oesophagostomum* inhabit almost exclusively the large intestine giving rise to the condition, more familiar to sheepmen and caused by a somewhat similar worm in sheep, known as pimply gut. The nodule worm of swine is a small white or grey worm, varying from half an inch to an inch in length, the female being the larger. Fortunately these worms are comparatively rare, and when infestation is light may do no damage to the older animals. In young stock the nodule worm is suspected as being responsible for intestinal irritation, unthriftiness and anaemia, and is also believed to be a contributing factor to peritonitis.

The life history is direct, the eggs being passed out with the faeces. Here they hatch and feed on the foecal matter for a short while and gradually grow into the infective stage. This stage is taken in by the pig with food or water eventually reaching the large intestine.

Treatment is difficult and is mainly concerned with prevention, by keeping the pigs under sanitary conditions.

Stomach Worms.

Of the four stomach worms recorded, *Arduenna strongylina* (Pl. 89, figs. 3, 3a, and 3b) and *Physocephalus sexalatus* appear the most important. These are small whitish to reddish worms usually found together and occupying the pyloric region of the stomach and upper small intestine. In size they may vary from three-fifths to seven-eighths of an inch. Pigs heavily infested with these worms will give evidence of thirst, restlessness and do not feed well. These parasites have a life history somewhat similar to the thorn-headed worms—various beetles playing the part of intermediate host, the pig being reinfested by eating these insects.

One American writer (Kingsley) states that *Arduenna strongylina* is a very common parasite in the stomach of swine. It is possible that at least 90 per cent. of swine are infested with these parasites. He also states that the *Simondsia paradoxa* infests the stomach of swine, but is probably not common in the United States of America, although quite prevalent in some sections of Europe.

Gnathostoma hispidum (Pl. 89, figs. 2 and 2a) has been recorded once only, from far Northern Australia.

Bladder Worms.

These are the larvae of various tapeworms which in the adult stage inhabit other animals. The most common bladder worm found in pigs is called *Echinococcus granulosus,* better known as hydatids. The adult of this tape worm lives in the dog. *Cysticercus tenuicollis* is more familiar to the sheepman. The so-called water-ball as known to slaughtermen being this larva. The adult, *Taenia hydatigena,* also lives in the dog. Hydatid cysts are usually found in the liver and lungs, whilst *Cysticercus tenuicollis* inhabits the omenta and mesenteries. Treatment in these cases consists in preventing pigs from eating the faeces of dogs, for in the faeces the eggs of the adults are to be found. Similarly dogs should not be given pig offal, as this would allow the ingestion of these larvae which would eventually reach the adult stage in the dog and become a further source of infection.

Cysticercus cellulosae, the cause of pig measles has not yet been recorded in Australia. The adult of this bladder worm is known as *Taenia solium*, and its host is man. Infection of the pig occurs through allowing these animals access to human faecal matter.

In pickling hams and pork and using a pickle pump to inject the thicker portions of the meat, it sometimes happens that gas or gas-forming bacteria are introduced which produce in the hams or bacon a peculiar bladder-like condition in the tissues (fatty) between the muscles and also in the connective tissue, and these at first sight resemble in appearance measly pork, but a careful examination will reveal the true condition.

Fasciola hepatica L. is most usually found in sheep, but has been recorded from both cattle and pigs. Although in New South Wales it is very prevalent among sheep in certain districts it has not been reported in any numbers from Queensland. The pig may be termed an accidental host, and in this State there is only one record of this animal acting as a host.

PREPARATION OF SPECIMENS FOR VETERINARY OR BACTERIOLOGICAL EXAMINATION.

If it is desired to forward to the Department of Agriculture and Stock specimens of diseased organs or parts, plants or seeds suspected of being poisonous, &c., for examination, it would be well to observe that by attention to the following instructions specimens for examination should arrive safely for investigation:—

Every specimen should have attached to it a label clearly written or printed indicating the sender's name and full postal address, the nature of the specimen submitted and from what animal or source obtained.

Small morbid specimens, including tumours, suspected tubercular growths and internal organs, should be forwarded in a sealed bottle, and preserved with either of the following:—

One part of commercial formalin to four parts of rain water.

Equal parts of methylated spirit and rain water.

Neither the methylated spirit nor the ordinary salt solution are as satisfactory as the formalin; the latter may be purchased at chemist shops at a very nominal cost.

The bottle should be well wrapped with plenty of old cloth or rags, packed securely in a tin container and sent by rail.

Large specimens are best surrounded with coarse salt, packed in a box, and railed immediately by most rapid route.

Internal parasites (worms) may be preserved in a small bottle containing equal parts of methylated spirit and water or formalin as above stated, and must be carefully packed and be sent by post.

External parasites, such as ticks, lice, &c., should be forwarded in the living condition in a tobacco box, securely packed with plenty of paper wrapping, with address and contents clearly indicated.

Blood Smears for Examination.

In some cases these afford valuable information. All that is required is to smear the merest trace of blood on one side only of a small piece of flat clean glass—thin window glass about 1 inch long and 2 or 3 inches wide. The blood film should be smeared once only and as thin as possible.

In suspected lung trouble the whole suspected lung, packed in formalin solution, should be forwarded.

There are usually no charges for examination of specimens but detailed advice *re* this could be obtained on application.

Specimen of grasses, &c., may be forwarded in a partially dried form; the specimen to include root, stem, leaves, flower or seed. If specimens are forwarded wrapped in blotting paper (clean) it would prevent development of mould. Seeds may be forwarded in any suitable container and should be packed in clean cotton wool.

In all cases forward to the Under Secretary, Department of Agriculture and Stock, Brisbane, advising by letter, 'phone or wire in ample time beforehand, so that arrangements may be made for examination prior to receipt of specimens.

AN INTERESTING JOURNAL.

A Mudgeeraba farmer, in appreciation of valuable assistance received from the Department of Agriculture and Stock, and also of the usefulness of this journal, writes (11*th August,* 1930): *" . . . I might say that the 'Queensland Agricultural Journal' is the most interesting paper a farmer could have . . ."*

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TOMATO CULTURE.

By Officers of the Fruit Branch, Department of Agriculture and Stock.

In recent years the production of tomatoes has materially increased, but taken as a whole it is doubtful whether the increase is proportionate to the larger area under this crop. Various factors have operated against the continuance of high yield, of which constant cropping of the same land is not the least important. The lack of efficient soil treatment, the introduction and establishment of disease in addition to such as may have already been established, and frequently insufficient attention all militate against high averages. It must also be admitted that the land cropped is not always of a nature best suited for tomato culture. These matters and points on grading and packing are discussed in these notes.—ED.

SOIL REQUIREMENTS.

A FINE alluvial loam with good fertility and efficient drainage is considered the most suitable, though excellent crops are also obtained from basaltic soils. Continuous cropping of the same land is not in any circumstances recommended; in fact, alternate sowing with green crops to plough into and maintain the supply of humus in the soil are necessary and will, in addition to maintaining the desired element in the soil, assist in retaining such fertilisers as are applied. Whatever green crops are used, the choice of variety depends upon local conditions. It should not be subject to eelworm or nematodes; therefore cow pea could not be recommended.

Maize sown broadcast and fairly closely provides a liberal supply of vegetable matter and is now receiving more general attention in this line. It will be found advantageous to apply the necessary fertiliser before planting the green crops so that a luxurious growth may be ensured; the fertilising elements which have been absorbed by it will be returned to the soil when it is ploughed under.

Ground that becomes sodden in wet weather becomes rapidly hard and dry after rain. Where a small plot, generally referred to as a soak, exists it may, according to the situation, be worth while draining it with agricultural pipes, but draining large areas is not profitable.

Good preliminary cultivation is most essential. Land which has not been under cultivation previously or is deficient in any or all of the plant foods should be liberally fertilised. Unfortunately, farmyard or stable manure is rarely available in sufficient quantity (its deficiency is responsible for much ploughing under of cover crops to provide the necessary mould); consequently other fertilising material must be applied, and the following formula is recommended:—1 to 1½ cwt. sulphate of ammonia, 5 cwt. of superphosphate and 1½ to 2 cwt. of muriate (or sulphate) of potash per acre. These should be thoroughly mixed, spread evenly over the soil, worked into, and thoroughly incorporated with it.

Planting.

Planting is usually done in rows and the plants subsequently allowed to grow at will, practically covering the soil surface. Staking with or without wiring is seldom practised, the extra labour not being considered warranted, but this is open to question, particularly where the available land is limited. The distance between plants ordinarily varies according to soil and local conditions from 4 feet to 8 feet, or even more according to local conditions. Where grown with the aid of stakes (with or without wires) they may be planted 18 inches to 2 feet apart, and 3 feet between the rows. The plants are trained to a single stem from the outset, all laterals being removed close to the stem without injuring the main foliage and the terminal bud removed when the height of the support has been reached, the plant being trained vertically; all parts are accessible to applications against fungi or insect pests. Where stakes are plentiful and light, one to each plant is used, 4 feet to 5 feet being allowed above the ground level, the plants being tied to them in three or four places before reaching the top. By the use of fairly heavy posts sunk well into the ground at distances of about 30 feet apart wire may be used. These may be kept in position by "droppers" reaching a short distance into the soil. The advantages of this system are that clean cultivation can be much more readily

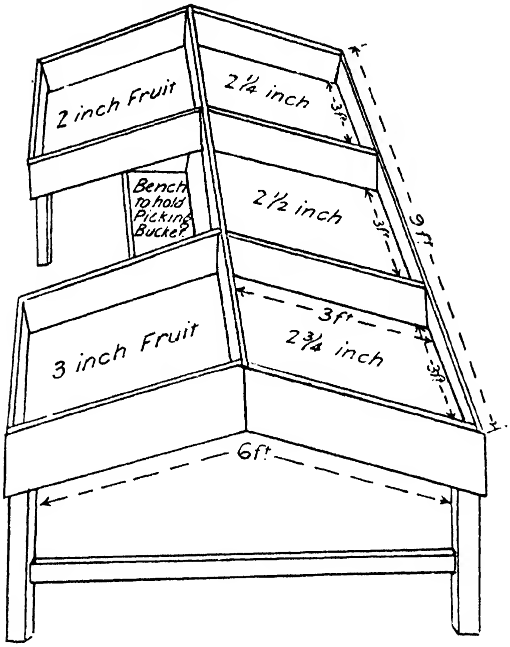


PLATE 90 (Fig. 1).—SIZING TABLE.

Diagram of sizing table containing bins for five sizes of tomatoes, and a space with bench built in to accommodate sizing hand.

Note.—This table should not be made too big, as this will cause rough handling of fruit.

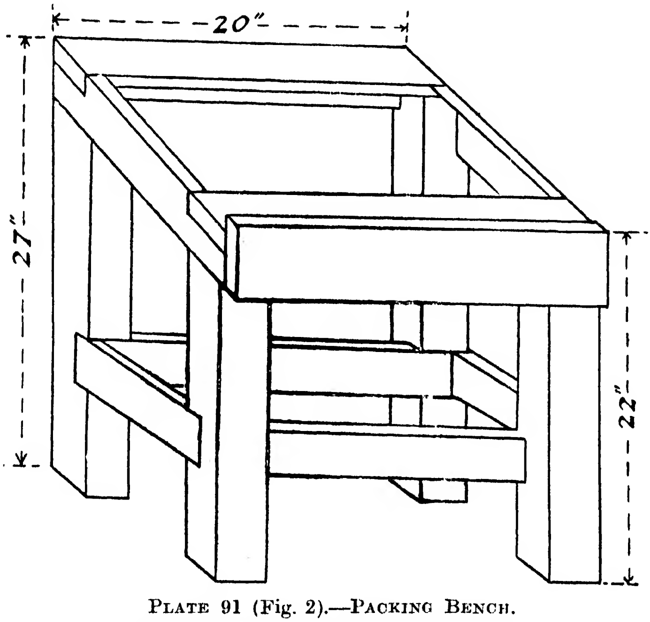


PLATE 91 (Fig. 2).—PACKING BENCH.

Diagram of a useful packing stand—height in front, 22 inches; height at back, 27 inches; distance from front to the back, 18 inches; legs, 3 inches x 3 inches; stays, 3 inches x 1 inch; front board, 5 inches x 1 inch. This stand should be made wide enough to hold two cases, thus permitting two counts to be packed at the same time from the sizing table.

practised; moisture is retained by lightly working the surface soil, and where necessary attention is given, practically no losses from blight nor caterpillar, also very much increased yields, in some instances over 100 per cent. are recorded.

Varieties.

As to varieties, preferences differ in every district, and no list of suitable varieties for all districts can be submitted. This is particularly instanced in the wilt-resistant properties claimed for Bowen Buckeye in the district of its origin, while under trial with a collection of other kinds a Hawkesbury proved to be the most susceptible to the disease. Growers have been advised repeatedly to save their own seeds from selected plants showing a combination of vigour, productivity, and even-shaped fruit of medium size. Excessively large fruit is generally prone to irregularity in shape, is seldom so freely produced, and for general purposes is not so much in demand as fruit of medium size. It is disappointing to note how few have accepted this advice, and it is a common practice to purchase imported seeds and to a lesser extent import seed direct from oversea. To lack of discrimination in this respect, the wide distribution of the ills which beset the plants are in a great measure responsible. As the tomato thrives so vigorously in this State it is reasonable to assume that an all round improvement could be effected by selection, for it will be noted that odd plants in a plot show marked advantages over others in their vicinity.

Much has been said in favour of the wilt-resistant varieties, among which Norton has not been superseded. Such varieties are, however, not so widely sown as one would expect, and the inference is that they are not considered as profitable as those for which no such claims are made.

Raising the Plants.

Diversity of opinion exists as to the advantages of planting the seeds in the position where the plants are to remain. The practice may present disadvantages in districts of light rainfall, but under ordinary conditions it has a most important feature to commend it. In transplanting no matter how careful the operation, many roots are broken and where such breakages occur an opening is made for the entry of injurious bacteria. Where seed-beds must be provided the same site should not be used for two seasons in succession.

Shade is sometimes necessary to secure even germination, and this can be obtained by the use of straw or even bags laid upon the ground in which the seed is planted, the covering being removed as soon as the young plants begin to appear through the soil. Before planting the seed the soil should be reduced to a fine tilth. That is important. Following planting the soil should be firmed either by beating with the back of a spade or shovel or completely treading it. A fine light layer of loose soil should then be scattered over the surface. In the absence of firming, the soil will frequently dry to a sufficient depth to prevent germination, even when watered daily.

Plants grown close together as seedlings in the seed-bed usually draw freely on the available moisture, and if this is not present make poor growth. An even and adequate supply of moisture is therefore necessary to develop robust plants, but for a day or two prior to transplanting (unless it should be during showery weather) watering should be entirely suspended.

In the field the land should be well prepared; deep working will assist the plants to withstand dry weather, and cultivation while it can be practised (throughout where staking is employed) will also materially help.

It is, unfortunately, a rather common sight to see rejected fruit scattered over the field where it decays, and in the process provides a medium for the development and spread of diseases and pests. Instead of the old stalks, and as far as possible the foliage, being collected and burned as soon as the plants become unprofitable they are left until some later date and then more or less ploughed into the soil.

MARKETING TOMATOES.

Much has been written on the subject of marketing different fruits, but the essential facts are still the same; grading, sizing, packing, and an attractive get-up to the finished package are the things that count. The grower must study the needs of the consumer, retailer, and agent to get the best price for his product.

Consumers want tomatoes of good quality and in a condition that will induce them to buy more, so increasing the demand and disposing of greater quantities. Immature, small, or grubby fruit are not appreciated, and many of the householders getting fruit of this description from the retailer cease to buy tomatoes for a week or so, thus causing an over-supplied market, with the consequent drop in prices.

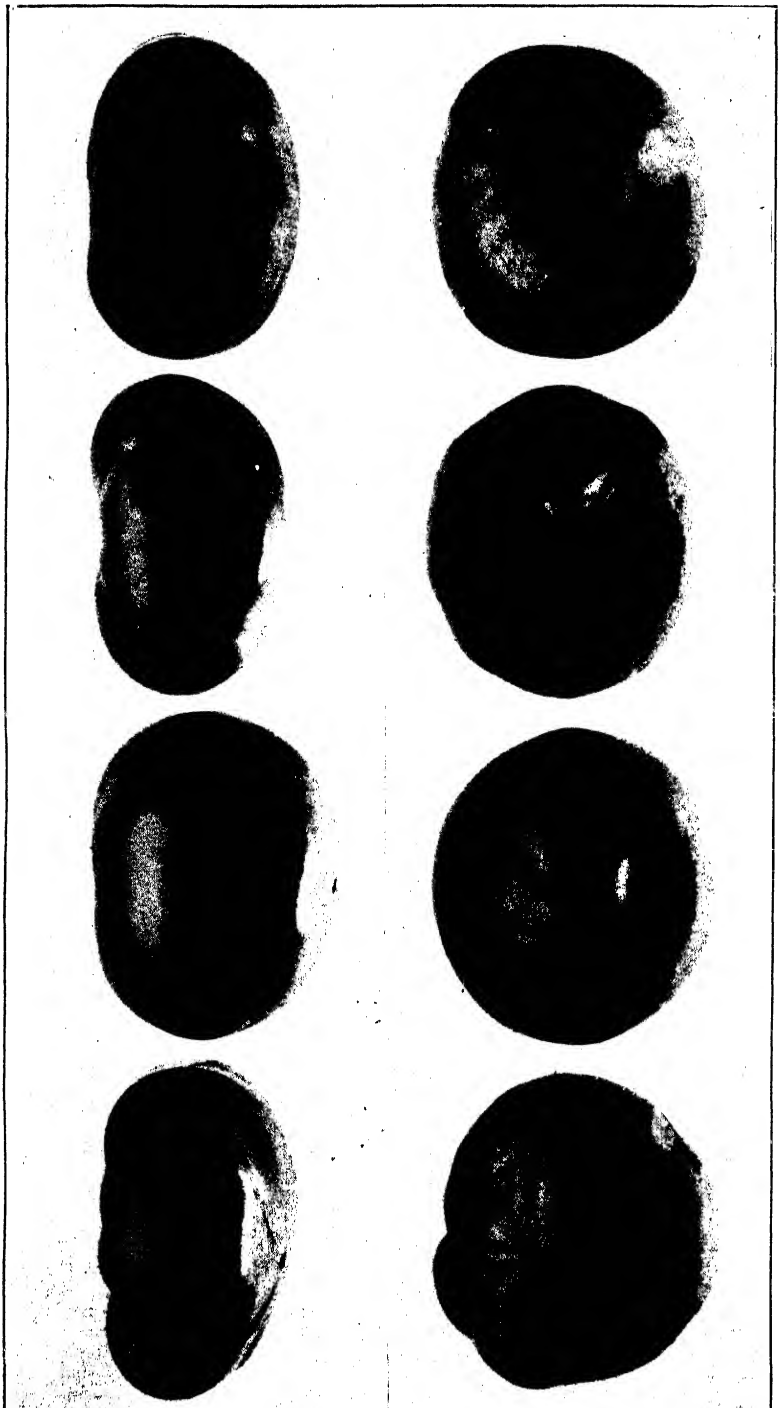


PLATE 92 (Fig. 3).

Four specimens of tomatoes photographed on edge and on the flat, showing the uneven layer which would be obtained with tomatoes packed on the flat, and the even layer obtained by placing the fruit on its cheek as is done when using the Standard Cheek Pack.

These were four tomatoes taken from a case in the market measuring $2\frac{3}{8}$ inches in diameter.

Retailers require tomatoes of a uniform quality to enable them to sell, if possible, 100 per cent. of good, sound, unblemished fruit, thus satisfying their customers and keeping up a demand.

Growers should remember that a good agent to handle their fruit is necessary, but the more important thing is to give a good agent good fruit to handle. Once the market receives bad fruit the demand ceases, prices drop, and agents then have difficulty in getting payable returns for the grower. Buyers will pick out the best packed and graded fruit, causing the grower of badly graded and packed lines to lose on his consignment. The advantages of good packing and grading are very pronounced on a slow market.

Grading.

With tomatoes, grading usually is the worst carried out operation, growers as a rule mixing all sizes and colours. We know that at the start of a season, owing to the small quantities of fruit ready to harvest, it is hard to separate all grades into separate cases, but this is an easy matter when the season is in full swing. Retail buyers and agents want fruit packed true to size and colour; fruit of a uniform size being either all green matured fruit fit for country orders or ripe fruit suitable for city and suburban trade. Growers in remote districts may possibly find difficulties in landing their tomatoes in perfect condition as regards colour on distant markets, but big improvements can be made by these growers. One sees in the markets fruit from distant districts almost totally green throughout the case, but having ,perhaps, a dozen to twenty ripe or nearly ripe fruits in the case. A case of this description of pack is of no use to any buyer. If bought for country trade, the ripe fruit would be found running out of the box on arrival at its destination, and not being ripe throughout the case it is of no use for a city or suburban buyer. Some growers reverse this practice by having ripe tomatoes with a few green specimens included. Another bad fault is the packing of immature tomatoes. Many growers in trying to catch early markets pick before the fruit is mature, so giving it no chance to even ripen properly. The public, through buying immature fruit at the start of the season when prices are high, is turned against tomatoes with the consequent causing of the marketing troubles mentioned previously. Any immature fruit that may be picked by accident should be rejected when packing. Diseased, blemished, and cracked fruit should not be included; one or two specimens of this description lowers the value of the whole case.

Sizing.

For the successful packing of tomatoes sizing is absolutely necessary, and must be done before proceeding to pack. It is possible with citrus, apples, or pears to pack without sizing first, but with tomatoes it is essential to size first. At present we do not know of any sizer that is a complete success for sizing tomatoes, but the revolving roller and moving belt type of appliance is a big help. The best method for the grower with a small acreage is a sizing table, a diagram of which is shown (Fig. 1). This can easily be made at home. It is necessary to have the centre raised to allow the fruit to run to the edges of the table where the packers are working. This saves reaching for fruit. Packing operations are conducted from the sides of the bins or compartments of the table. To save throwing or rough handling on the part of the operator sizing the fruit, it is advisable not to make the table too big. Benches 3 feet by 3 feet are a good size; this would mean a table 9 feet long by 6 feet wide. There are five compartments for sizing, the space in the middle at one side being used by the sizer to stand in whilst sizing. A bench for standing the packing bucket on is a great convenience and time saver—allowing the sizer to use both hands for operations. Best results will be obtained where it is possible always to have the sizing done by the same person, who will soon become very fast and expert.

A packing stand to hold two cases can also be easily made (Fig. 2). Packers are advised to pick two sizes together from each bin.

Packing.

Many and varied are the ways one sees the operation of packing carried out. Flat packs, solid packs, and square packs all have their supporters, but the standard cheek pack with its pocket system has all the advantages; easy to learn and easy to do when following on the sizing operation, and all sizes will pack correctly. The most popular box for marketing tomatoes is the dump half bushel 18 inches by 8⅝ inches by 7¼ inches, but some growers use the half long-bushel case with a partition 26 inches

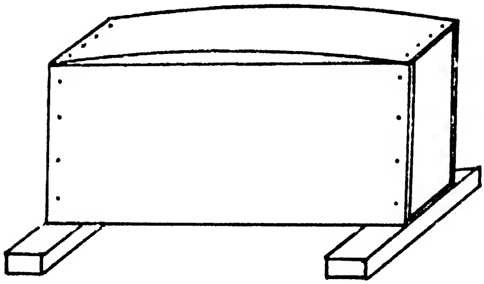


PLATE 93 (Fig. 4).—NAILING DOWN.

Method of placing two pieces of timber on the floor of shed. This makes a good solid nailing down bench, and permits the bottom of the case as well as the top to bulge slightly when the lid is nailed on.

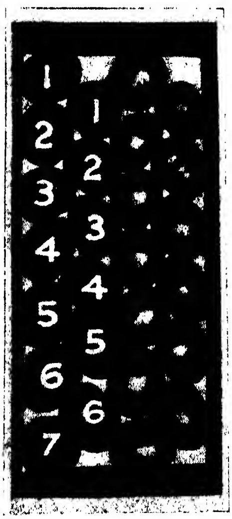


PLATE 94 (Fig. 5).

The method of obtaining the layer count is by counting two alternate lines of fruit from end to end of the case.

by 6 inches by 7¼ inches. The advantages of the dump half bushel are as follows:—Easier and quicker to make up through having no partition, a better shape for handling, stacking, and carting, and, being wider, easier to pack into—allowing a packer more room to work with greater speed. Its shape also lends itself to displaying fruit to better advantage. Some packers make the dump half bushel case the narrow way 18 inches long by 7¼ inches wide by 8⅝ inches deep (Figs. 11 and 12), but making it the broad way 18 inches long by 8⅝ inches wide by 7¼ inches deep is to be preferred—allowing more room to work in, and giving fewer packs and counts (see packing tables), with greater ease in sizing. It also has fewer sizes that give trouble to the beginner in getting fruit up to the correct height in the case. The best plan is, where possible, to pack the tomatoes over-night, nailing them down and despatching the next day.

By studying the illustration (Fig. 3) of the four specimens of tomatoes shown on their cheek and on the flat there will be seen one of the great reasons why we use the cheek pack in preference to the flat pack. By placing fruit of a given diameter, which is the system of sizing used commercially, we get an even, level layer, but by placing fruit on the flat we get uneven layers to pack on, which greatly increases our difficulties in bringing the case up to an even face for lidding or for display purposes. It would also be impossible to have standard packs and counts if using any system but the standard diagonal cheek pack. Once a type of tomato of a given diameter is packed correctly the same type and size will always pack correctly and give the same count by using the same pack.

PACKS THAT WILL BRING TOMATOES TO THE CORRECT HEIGHT IN THE DUMP HALF-BUSHEL CASE.

In cases made on the wide system (Fig. 8), 18 in. long, 8⅝ in. wide, 7¼ in. deep.					In cases made on the narrow system (Figs. 11 and 12), 18 in. long, 7¼ in. wide, 8⅝ in. deep.				
Size.	Pack.	Layer Count.	Number of Layers.	Total.	Size.	Pack.	Layer Count.	Number of Layers.	Total.
	3-2	9-9	4	180		3-2	8-7	6	225
	3-2	9-8	4	170		3-2	7-7	6	210*
2¼	3-2	8-8	4	160		3-2	7-6	6	195*
	3-2	8-7	4	150		2-2	9-9	5	180
2½	3-2	7-7	4	140		2-2	9-8	5	170
	3-2	7-6	4	130	2¼	2-2	8-8	5	160
	2-2	7-7	4	112*		2-2	8-7	5	150
	2-2	7-6	4	104*	2½	2-2	7-7	5	140
2¾	2-2	6-6	4	96*		2-2	7-6	5	130*
2¾	2-2	8-8	3	96		2-2	6-6	5	120*
	2-2	8-7	3	90		2-2	6-5	5	110*
	2-2	7-7	3	84	2¾	2-1	9-8	4	102
3	2-2	7-6	3	78		2-1	8-8	4	96
	2-2	6-6	3	72		2-1	8-7	4	90
	2-1	8-7	3	68		2-1	7-7	4	84
3¼	2-1	7-7	3	63*	3	2-1	7-6	4	78
						2-1	6-6	4	72
					3¼	2-1	6-5	4	66*
						2-1	5-5	4	60*
						2-1	6-5	3	50

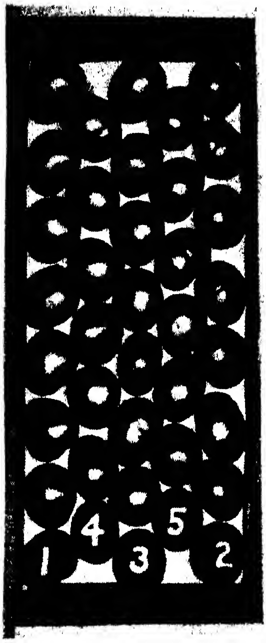
* Denotes open packs.

Nailing down is best carried out by placing two battens lengthways on the floor so that the ends of the case will rest on them, allowing the bottom to bulge slightly when the lid is nailed on (Fig. 4).

The chief points of the standard pack are as follows. Memorising these will assist the beginner a great deal:—

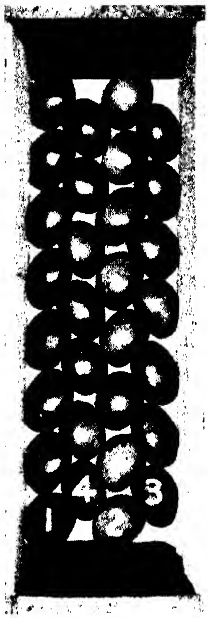
1. All fruit to be placed on edge, that is, on its cheek;
2. Use three packs: 3—2, 2—2, and 2—1 (Fig. 6).
3. Two fruits must not rest directly one on top of the other but in the pockets formed by the spaces between the fruit of the previous layer (Fig. 7).

3—2 pack, 8 x 7 layer, 4 layers in the case, total 150. The layer count is obtained by counting from end to end two side by side lines of fruit in the case. (*See* Fig. 5)



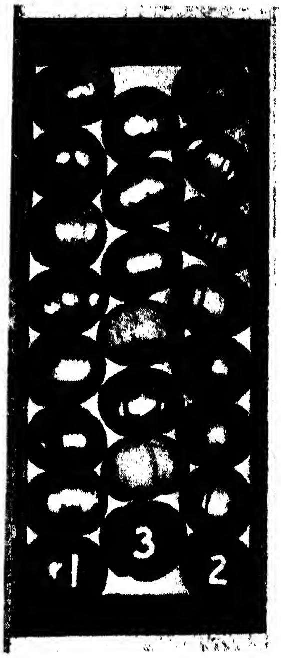
First layer 3—2 pack. The pack gets its name from the first layer being started with three placed against the end of the case and then two being placed in the pockets formed by the three. his is repeated until the layer is full.

2—2 pack, 7 x 6 layer, 3 layers in the case, total 78. The layer count is obtained by counting from end to end two side by side lines of fruit in the layer. (*See* Fig. 5.)



First layer 2—2 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then two being placed in the pockets formed by the two. This is repeated until the layer is full.

2—1 pack, 8 x 7 layer, 3 layers in the case, total 68. The layer count is obtained by counting from end to end the side by side lines of fruit in the layer. (*See* Fig. 5.)

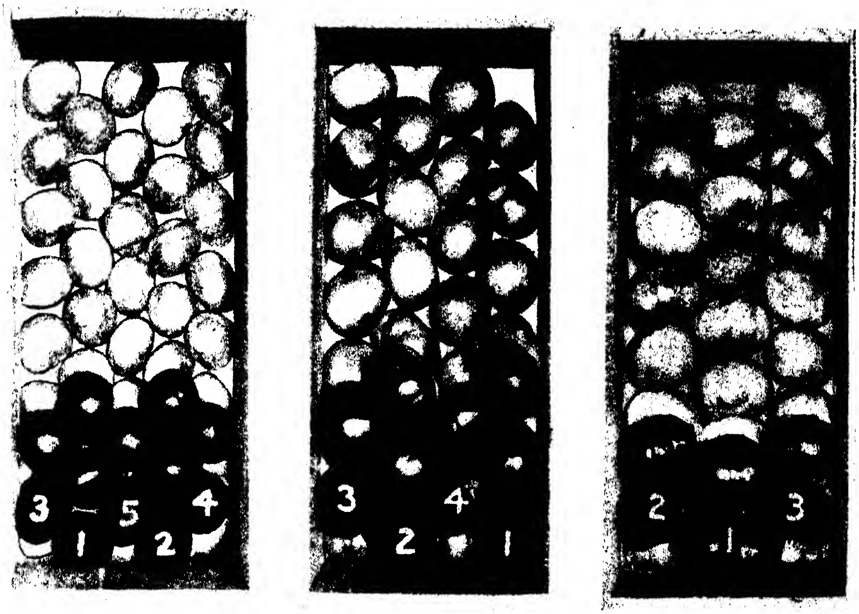


First layer 2—1 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then one being placed in the pocket so formed This is repeated until the layer is full.

PLATE 95 (Fig. 6).—FIRST LAYERS OF THE 3—2, 2—2, AND 2—1 PACKS.
Note the order and position of placing each fruit.

4. The height of the fruit in the case is governed by the size of the pockets in each layer (Figs. 9 and 10).
5. Correctly packed fruit is always placed in straight lines from end to end, across and diagonally in the case (Fig. 8), the fruit always being in alignment.

The illustrations show the method of carrying out the rules of packing, and also show the method of placing the fruit and arriving at the name of pack and layer count mentioned in the table of packing counts (see Fig. 5). Reference to the packing count table will give the beginner an idea of the pack to use for each size. Packing counts are given for the dump half case made both ways and for



Second layer 3—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with three tomatoes.

Second layer 2—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with two tomatoes.

Second layer 2—1 pack. This layer starts with one tomato resting in the pocket of the first layer, which started with two tomatoes.

PLATE 96 (Fig. 7).—METHOD OF PLACING FRUIT IN PACK.

Note how the tomatoes rest in the pockets of the previous layer.

the long half-bushel case. A handy sizing gauge can be made by cutting holes 2 inches, 2¼ inches, 2½ inches, 2¾ inches, 3 inches, and 3¼ inches in diameter in a piece of plywood. A 2¼-inch fruit is one that will drop through a 2½-inch ring but not through a 2¼-inch ring; 2½-inch is fruit that will not go through a 2½-inch ring but will drop through a 2¾-inch ring. The same method of measuring applies to the other sizes. It is necessary to make a good start in packing the case correctly, and great care should be taken to see that a good snug, firm, first layer with all fruit in alignment is packed. By placing the correct sized fruit in the pockets of the first and each successive layer the packer will soon learn to pack correctly. By studying the illustrations of the start of the second layer packers will see how the second layer fits in the pockets of the first layer. The third layer is the same as the first, being placed in the pockets of the second layer. It is advisable not to try to pack too fast when first learning. Pace is acquired with practice.

That the height of the fruit is governed by the size of the pockets in each layer, is the most important rule in packing to remember. The counts marked with an asterisk (*) are the counts that are likely to give trouble. As an example, we will take the 2½-inch tomato, 2—2 pack, 7—6 count, with 104 tomatoes. Most packers would try to pack this 2—2 with closed pockets 8—8 count with three layers containing 96 tomatoes, which would come low (Fig. 9), but by opening the pockets and getting a 2—2 pack, 7—6 count, and four layers containing 104 tomatoes (Fig. 10) the case is brought to the correct height without any trouble. The difference in the two cases is: Incorrect count 3 layers of 32, total 96; correct count, 4 layers each containing 26, or 8 more tomatoes to the case. This pocket system can be worked with all types of fruit, and the packer who masters it is soon expert in packing. Study the packing counts and see the packs that have to be packed with the open pockets, these being the only counts that may present difficulties to the beginner.

Noticing the correct alignment of fruit when packing is a guide to the packer, faults being easily detected by observing the pack getting out of alignment. When this occurs the packer should correct the fault immediately by removing the incorrectly sized fruit.

Mistakes must be corrected as they occur, because it is impossible to finish a case perfectly if any one layer is wrong. Packing a layer with fruit too small and placing in two extra is the most common fault found with beginners. When finishing off a case packed with open pockets many packers place two extra small tomatoes in the pockets at the end of the top layer, making it hard to get the lid on and spoiling the alignment of the whole case. A case only holds a certain quantity, and placing more in the case only causes bruising or splitting.

It will always be wise to remember the following points in marketing:—

Good packing alone will not keep up a demand for bad fruit. Good fruit is always necessary, and good fruit well packed and attractively got up is easy to sell and will, in times of over-supply, be the first to be disposed of.

Some growers wrap their tomatoes, but the use of lining paper only is really all that is necessary. It improves the appearance of the finished case to use plain or coloured paper for lining in preference to the use of newspaper, which looks shoddy and shabby, favoured by some of the growers. A coloured label also adds distinction to the packed case, and is recommended. Good packing and get-up followed by careful handling and loading whilst in transit to the market will give the grower the best returns for his labour. Using a packed case as a seat while carting is a very common fault with growers and carters, as is also the walking on cases while stacking in trucks. Want of thought is the reason as a rule why fruit is badly handled in these ways.

Acknowledgment.

Thanks are due to Mr. P. Bach, Pinklands, Mr. A. F. Smith, and Mr. W. Burns, Thornlands, and Arkell and Sons, Fruit Exchange, Brisbane, for making available fruit for illustrations.

Main Points to Remember.

In conclusion, the following are the main points for packers and others who handle fruit to remember:—

Don't place green and ripe fruit in the one case.

Don't place one fruit directly on top of another when packing, but keep them in the pockets of the preceding layer.

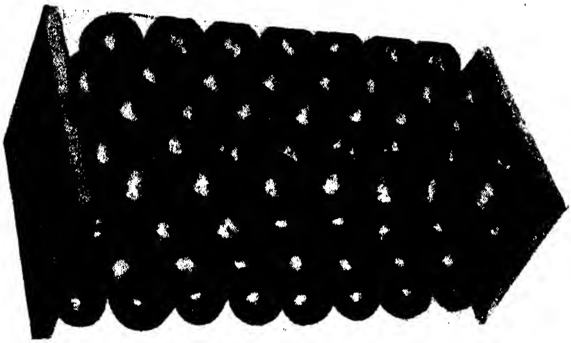
Don't stand, walk, or sit upon packed cases.

Don't pack immature green tomatoes; they will not ripen properly.

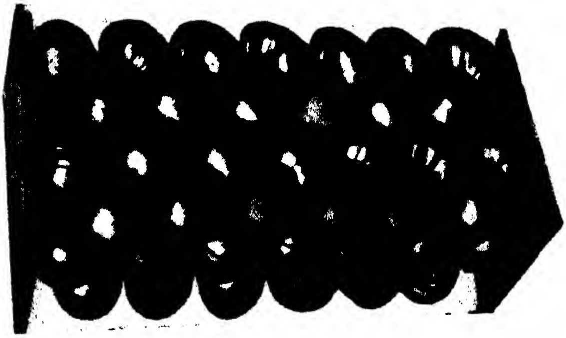
Don't pack defaced, marked, or damaged tomatoes; they reduce the value of the case.

Don't use newspaper for lining; plain paper pays.

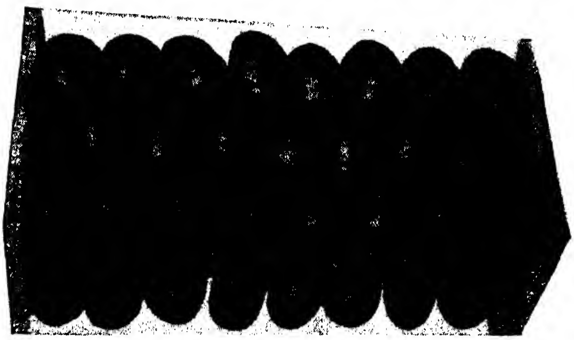
Don't try and pack large and small tomatoes in the one case; it spoils the alignment and the appearance of the pack and helps to reduce the price of the case.



Finished case, 3—2 pack.

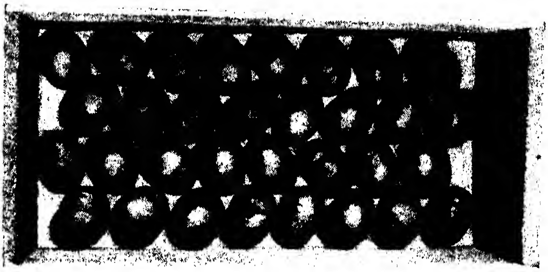


Finished case, 2—2 pack.

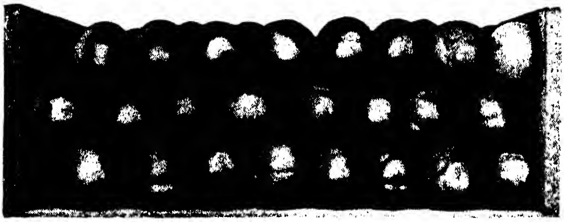


Finished case, 2—1 pack.

Plate 97 (Fig. 8).—Alignment of Fruit in the Case.



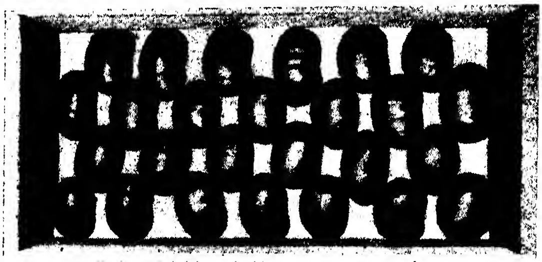
First layer.



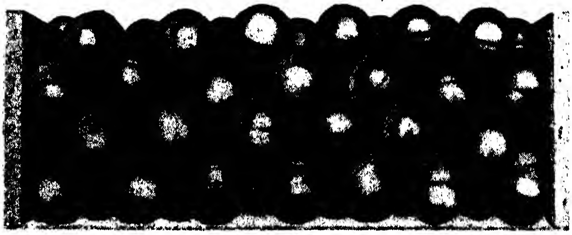
Finished case not high enough.

PLATE 98 (Fig. 9).

2½-inch tomatoes packed 2—2 with closed pockets, 8 x 8 count, 3 layers, 96 tomatoes, which is too low, but when packed with open pockets, as in Fig. 10, comes to the correct height.



First layer.

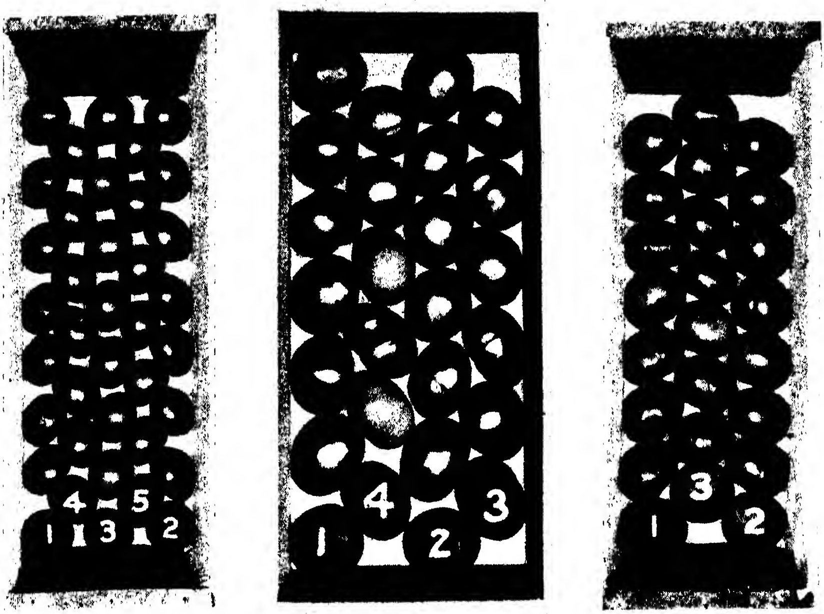


Finished case.

PLATE 99 (Fig. 10)—THE SAME FRUIT AS IN FIG. 9.

Packed 2—2, with open pockets, 7 x 6 count, 4 layers, 104 tomatoes, which comes to the correct height.

These illustrations explain the rule—"The size of the pocket governs the height of the fruit in the case."



3—2 pack. 8 x 7 count, 6 layers, total 225.

2—2 pack. 6 x 7 count, 5 layers, total 150.

2—1 pack. 8 x 8 count, 4 layers, total 96.

PLATE 100 (Fig. 11).—FIRST LAYERS PACKED IN CASES MADE ON THE NARROW SYSTEM.

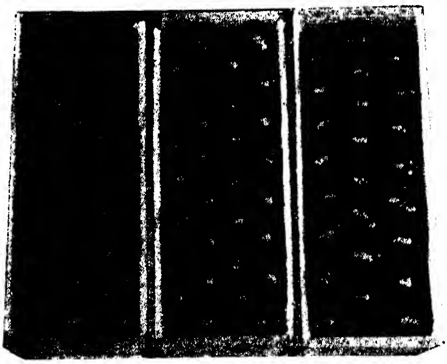


PLATE 101 (Fig. 12).—FINISHED PACKS IN CASES MADE ON THE NARROW SYSTEM—18 IN. LONG, $7\frac{1}{8}$ IN. WIDE, $8\frac{3}{8}$ IN. DEEP.

POULTRY FEEDING TEST.

THE rapid development of the poultry industry and the resulting increased demand for the more popular poultry foods suggested the need of a feeding test to decide their relative values. Accordingly, a test was commenced on the 1st May, 1929, at Mount Gravatt, by officers of the Department of Agriculture and Stock, with the object of making a comparison with wheat and wheat by-products on the one hand and maize and maizemeal on the other; and, as barley can be secured at reasonable prices at times, it was considered desirable to utilise this grain in a test also. It was hoped to serve a double purpose in so far as that individual records of production might be obtained per bird as well as the determination of the suitability of various foods for egg production.

The test commenced with 288 birds belonging to different poultry breeders. Each breeder supplied twenty-four birds of the same age, breed, and, as far as possible, of the same strain. These birds were divided into groups of eight and placed in a large shed for intensive attention with a similar number of birds of other breeders. By working along these lines it was thought that the average breeding of the birds in each pen would be uniform, and in order that the breeders who supplied birds would gain some advantage, the birds were all trap-nested and their owners supplied fortnightly with the progressive results of egg production.

Feeding.

The system of feeding was to place a mixture in the form of dry mash in hoppers. The grain was also fed in hoppers. Under these conditions the birds were at liberty to consume as much as they desired of either mash or grain. In "A" pen the mash was composed of 37 per cent. of maizemeal, 20 per cent. of bran, 15 per cent. of lucerne meal, 10 per cent. of pea meal, 10 per cent. of meat meal, 5 per cent. of cotton seed meal, 2 per cent. of bone meal, and 1 per cent. of salt; while the grain supplied was whole yellow maize. In pen "B" the mash consisted of 52 per cent. pollard, 26 per cent. bran, 12 per cent. lucerne meal, 7 per cent. meat meal, 2 per cent. of bone meal, and 1 per cent. of salt, while the grain supplied was wheat. In the other pen neither bran nor pollard was used in compounding the mash, a feature of considerable importance to poultry raisers in Queensland. The mash, in this case, consisted of 52 per cent. of maize meal, 15 per cent. of lucerne meal, 10 per cent. of pea meal, 10 per cent. of meat meal, 10 per cent. of cotton seed meal, 2 per cent. of bone meal, and 1 per cent. of salt. With the grain supply another departure from the usual practice was adopted in the feeding of barley. In addition, a quantity of lawn clippings was supplied to each pen regularly.

AVERAGE FOOD CONSUMPTION.

——	Pen A.		Pen B.		Pen C.	
	Lb.	oz.	Lb.	oz.	Lb.	oz.
Grain per bird	38	1	57	4	43	6
Mash per bird	31	3	18	5	27	5
Total	69	4	75	9	70	11
	oz.		oz.		oz.	
Food consumed daily per bird ..	3·4		3·7		3·4	

Laying.

The laying of the birds was not of an exceptionally high standard. This, however, must not be attributed to inferior stock or to an inferior method of feeding; for the ration supplied to pen "B" conformed very closely to that used in many egg-laying competitions. The poor laying was undoubtedly due to (1) changed housing conditions; (2) sudden change in diet; and (3) change of environment at a critical period. The last reason caused many birds to break into a slight moult and, in many cases, a full moult.

The following table gives the final results for each breeder, as well as the total production in each pen:—

FROM 1ST MAY, 1929, TO 30TH MARCH, 1930.

Owner.	Total Eggs Laid. 1st Grade.	Total Eggs Laid. 2nd Grade.	Total Value. £ s. d.
White Leghorns.			
A. A. Cousner	1,900	1,135	16 18 0
Queensland Hatcheries	1,185	1,590	16 4 4
Geo. Currie	1,867	1,042	16 2 8
W. E. Woodward	1,819	1,172	16 2 1
Ray Harrison	1,529	1,220	15 3 11
Geo. Cox	1,507	1,086	13 16 7
H. M. Campbell	1,274	1,256	12 16 9
H. L. Marshall	1,460	813	12 11 8
Geo. Pitt	887	1,413	12 8 9
Woodlands Poultry Farm	1,494	953	12 6 9
Australorps.			
J. D. Hiddle	1,604	1,064	14 12 7
P. U. Gooch	1,530	957	14 8 8

TOTAL PRODUCTION.

Pen A.—11,750. Pen B.—12,229. Pen C.—11,380.

EGGS LAID IN EACH PEN FROM 1ST MAY, 1929, TO 22ND MARCH, 1930.

Eggs Laid.	Pen A.	Per centage.	Pen B.	Per centage.	Pen C.	Per centage.
First Grade	6,371	55·8	5,239	44·0	6,285	57·0
Second Grade	4,180	36·6	5,354	45·5	4,012	36·4
Eggs under weight	870	7·6	1,305	10·5	719	6·6
Totals	11,421	..	11,898	..	11,016	..
Eggs laid out traps	211	1·8	245	2·0	262	2·3
Average number of eggs laid per bird	Pen A. 137·2		Pen B. 145·7		Pen C. 129·0	

Two features brought out in this test were—

(1) The wheat ration gave better production; and

(2) In both cases where maize was extensively used the proportion of first grade eggs was greater than that from the wheat ration; there were also considerably fewer undersized eggs produced, as will be seen in the above table.

No definite conclusion can be drawn from one test of this nature, but there appears to be no reason why maize should not be more extensively used in feeding for egg production, and, when the price justifies it, used practically to the exclusion of wheat and wheat by-products.

Although fewer small eggs were obtained from the maize-fed pens, the production of individual birds, in some instances, show that a greater proportion of second grade eggs was produced by the maize-fed pens. This is shown in the results obtained by breeders 4, 7, 8, and 12 in the following table:—

EGGS LAID (EXCLUDING UNDERSIZE) FROM 1ST MAY, 1929, TO 22ND MARCH, 1930.

Breeder.	Pen A.		Pen B.		Pen C.	
	1st Grade.	2nd Grade.	1st Grade.	2nd Grade.	1st Grade.	2nd Grade.
1	609	334	445	324	464	228
2	568	285	580	518	652	356
3	333	425	137	687	416	285
4	499	231	670	210	277	329
5	778	244	339	510	731	288
6	540	321	439	592	522	159
7	344	564	313	478	523	520
8	557	347	692	327	639	453
9	671	269	330	463	509	480
10	549	233	418	424	517	295
11	249	450	532	557	475	241
12	674	477	344	264	560	318

Values.

The table showing the quantity of food consumed for each dozen eggs and the profit over cost does not indicate any very marked advantage in the feeding of maize. However, during the greater portion of the testing period maize was costly, but when the quantity required to produce a dozen eggs is taken into consideration, it will be noticed that there is a slight advantage. With the maize ration, accordingly, when maize is cheaper than wheat it would be a sound policy for it to be extensively used, providing the change in diet is made a gradual process.

TABLE SHOWING FOOD CONSUMED PER DOZEN EGGS, AND COSTS, NET MARKET RETURNS AND PROFIT PER DOZEN EGGS OVER FEEDING COSTS.

Period Ending.	Food Consumed per Dozen Eggs.			Cost of Feed per Dozen Eggs.			Nett Egg Prices per Dozen.	Profit per Dozen Eggs over Feeding Costs.		
	Pen A.	Pen B.	Pen C.	Pen A.	Pen B.	Pen C.		Pen A.	Pen B.	Pen C.
	Lb.	Lb.	Lb.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
1929.										
6 June ..	6·9	8·3	8·2	8·6	9·5	11·6	22·7	14·1	13·2	11·1
29 June ..	6·9	8·6	7·7	8·7	9·7	10·8	16·9	8·2	7·2	6·1
27 July ..	7·2	7·2	8·1	8·2	8·2	11·4	14·4	6·2	6·2	3·0
24 August ..	4·3	6·0	5·2	5·6	6·8	6·7	11·4	5·8	4·6	4·7
21 September	4·6	4·3	4·2	6·0	5·4	5·9	10·5	4·5	5·1	4·6
19 October ..	5·6	5·1	5·2	6·9	5·9	6·7	10·6	3·7	4·7	3·9
16 November	4·4	5·7	6·6	5·4	6·5	8·8	10·6	5·2	4·1	1·8
14 December	6·2	5·2	5·6	7·7	6·0	7·5	11·9	4·2	5·9	4·4
1930.										
11 January ..	5·2	5·7	5·8	6·4	6·5	7·7	11·0	4·6	4·5	3·3
8 February	9·8	6·1	7·6	12·2	7·0	10·2	12·7	0·5	5·7	2·5
8 March ..	11·9	8·1	12·1	14·7	9·3	16·1	13·8	*0·9	4·5	*2·3
22 March ..	12·4	12·1	11·2	15·4	13·9	15·0	15·4	..	1·5	0·4
Average ..	6·1	6·2	6·5	7·5	7·1	8·7	13·6	6·1	6·5	4·9

NOTE.—The asterisk denotes that a loss resulted in A and C pens.

Effect on Bodily Weight.

All birds were weighed on entering the test, and those in lay were weighed once every four weeks when removed from the trap nests, and a final weighing was made when the birds were crated and returned to their owners.

The following is the average weight of each lot on entering the test, and again at the termination:—

Lot.		Pen A.		Pen B.		Pen C.	
		Lb.	oz.	Lb.	oz.	Lb.	oz.
1	Commencement	5	3	5	3	5	1
	Termination	4	14	5	2	4	14
2	Commencement	4	1	4	2	4	6
	Termination	3	15	4	2	4	1
3	Commencement	3	2	3	3	3	3
	Termination	3	6	3	4	3	5
4	Commencement	4	3	4	5	4	1
	Termination	3	12	3	13	3	10
5	Commencement	3	9	3	9	3	11
	Termination	3	8	3	8	3	7
6	Commencement	4	8	4	4	3	12
	Termination	3	8	4	1	3	2
7	Commencement	3	9	3	11	3	10
	Termination	3	15	3	11	3	5
8	Commencement	4	3	4	1	3	11
	Termination	3	12	4	0	3	11
9	Commencement	4	3	4	3	4	3
	Termination	3	7	3	8	3	12
10	Commencement	4	2	4	0	3	11
	Termination	3	14	3	13	3	7
11	Commencement	3	11	3	10	3	11
	Termination	3	11	4	0	4	0
12	Commencement	4	14	5	3	5	3
	Termination	4	13	5	1	4	10

Extensive maize feeding is credited with causing the birds to become unduly fat. There is absolutely no evidence of that being the case in this test.

Mortality.

During the currency of the test the mortality of stock was exceptionally heavy, being as follows:—

CAUSE.

Pen A. 14 Deaths.		Pen B. 26 Deaths.		Pen C. 16 Deaths.	
Protrusion	4	Roup	7	Roup	6
Intestinal Tumor	3	Hemorrhage of Liver	3	Wasting	3
Heat	2	Wasting	5	Tumour	4
Kidney Disorder	2	Kidney Disorder	2	Kidney Disorder	1
Wasting	1	Heat	2	Hemorrhage of Liver	1
Hemorrhage of Liver	1	Not Diagnosed	4	Protrusion	1
Roup	1	Tumour	2		
		Protrusion	1		

COCCIDIOSIS IN CHICKENS.

Notes on this subject by Mr. P. Rumball, Poultry Expert, were published in the Journal for November, 1927, and, in response to numerous requests from our readers, they are now reprinted after revision (in the absence of Mr. Rumball, who is attending the World's Poultry Congress in England) by Mr. J. J. McLachlan, Poultry Inspector.

THIS is probably the most destructive disease affecting chickens in Queensland. The disease, however, is not confined to chickens only, as well developed pullets frequently lose the use of their legs as a result of infection, while adult birds are often affected in a chronic form. Death from chronic infection may take place in a few days, or the bird may linger several weeks. With chickens between the ages of two and eight weeks the disease assumes serious proportions, particularly so under favourable conditions.

Cause.

Coccidiosis is caused by microscopic parasites termed *Eimeria Avium*, which when taken into the digestive tract by susceptible chickens rapidly develop and multiply in the walls of the intestines, particularly the cæca or blind gut.

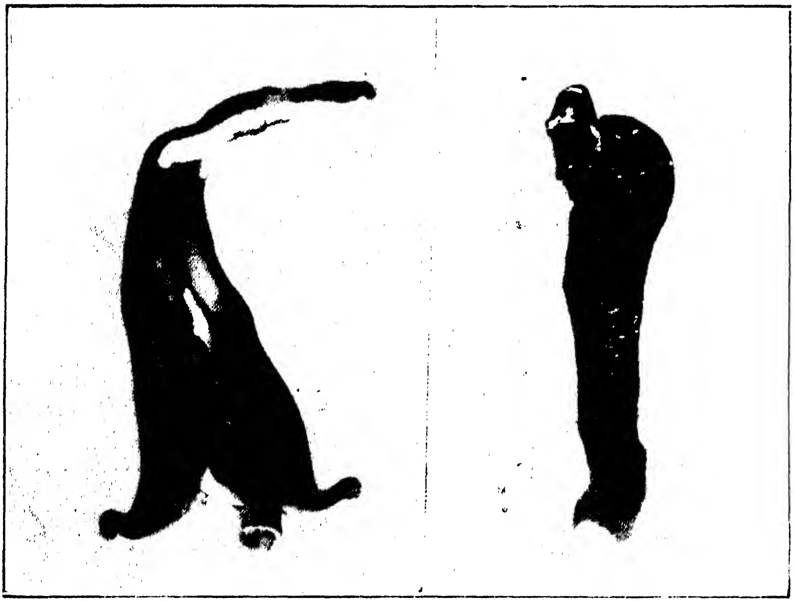


PLATE 102 (Fig. 1).

Showing cæca and portion of opened cæca from two 4-week old infected chicks Note the red blotches where these parasites have damaged the inner walls of this organ. This condition is not always so pronounced.

Life Cycle.

In the completion of its life cycle the parasite passes through many stages of development. A knowledge of certain of these forms is of practical importance in the application of efficient methods of prevention and ontrol.

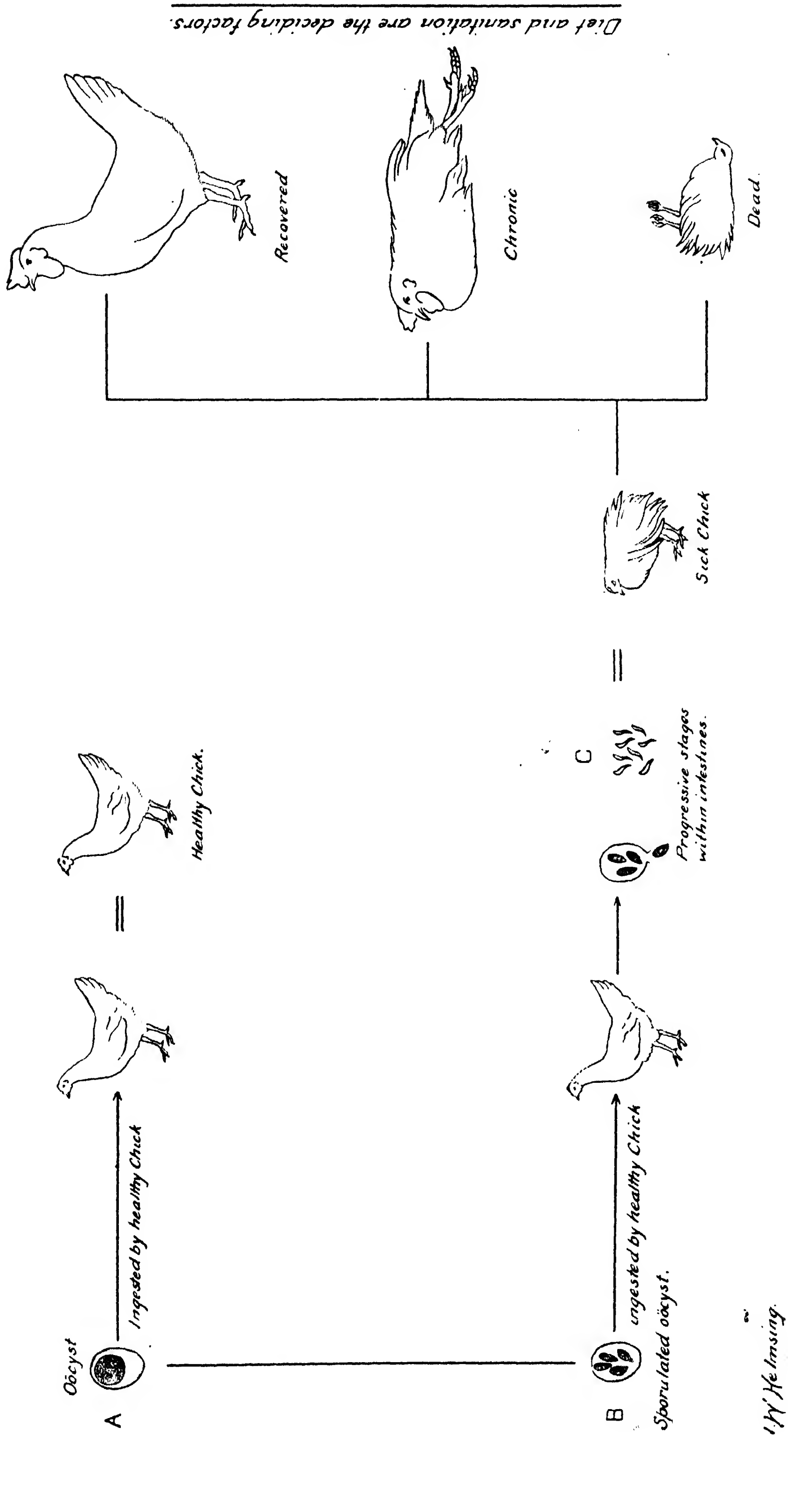


PLATE 103 (Fig. 2).

Showing life cycle of *Eimeria Avium*, the cause of Coccidiosis.

The first, or egg stage, is known as the oöcyst, the organism being encompassed by a covering which is comparable to the outer membrane of a hen egg, and by a fluid like the white of an egg; this organism is similar in shape to the yolk of an egg (see Fig. 2A). These oöcysts are voided with the droppings of diseased birds. In this stage the organism will not cause coccidiosis if taken back into the digestive system. The conditions under which chicks are generally reared, however, lend themselves to sporulation or the second stage of development (see Fig. 2B). In making this change a period of two to three days is required, depending on the suitability of conditions. Moisture and temperature are the governing factors. When changing, the part which compares with the yolk divides into four bodies. In this stage the parasite is capable of producing the disease in approximately forty-eight hours, and when the sporulated oöcysts are taken into the digestive tract of chickens another change takes place. The four bodies are released, and again divide. These are termed "sporozoites" (Fig. 2C). The parasite then begins to live on the mucus lining of the intestine and cæca, undergoing several changes until eventually the oöcyst or egg stage is produced and is voided with the droppings.

Knowing a little of the life cycle of this parasite, which takes five to six days to complete under favourable conditions, it can be readily understood how rapidly it will multiply, also the easy manner in which it is transmitted from chick to chick, by sporulated oöcysts adhering to particles of food or even per medium of the drinking water. It can be carried from pen to pen by adhering to the attendant's boots; flood waters, flies, wild birds, brooder equipment, and many other ways are also responsible for transmission of this disease from pen to pen and farm to farm. It is claimed by some authorities that the sporulated oöcyst will remain alive in the soil for over a year. Breeders, therefore, who have experienced this disease should take precautionary measures to prevent its recurrence by disinfection and the spelling of pens.

Symptoms.

The first indication of the disease is the tendency of the chicks to bunch together, with closed eyes and drooping wings. On being disturbed they move about, apparently quite normal, with the exception that their backs appear to have somewhat shortened. The tips of their wings, vents, and rear portions of their bodies are frequently stained with excreta. If an examination is made of the excreta of the chickens it may be found to be brick-red in colour, due to the presence of blood in the droppings. The parasites living on the mucous lining of the intestines cause the destruction of small blood vessels resulting in hemorrhage. However, blood is not always present in the droppings. During the day or the following morning some of the chicks will die, and the number of shortened-backs and droopy-winged chickens will have increased.

PLATE 104 (Fig. 3).—CHICK WITH COCCIDIOSIS IN SEVERE FORM.
Note the tips of the wings are stained with blood.

On opening up one of the dead chicks the upper portion of the small intestine will be found to be in an inflammatory condition. Blood may be also present among its contents. These conditions are usually more pronounced in the cæca of the chick, which is generally distended and filled with blood. In many cases, the lining of the cæca will have completely disappeared. The other internal organs are generally in a healthy condition. Chicks which survive severe cæcal coccidiosis usually have yellowish or whitish cheese-like "cores" in the cæca in a few days following the development of the symptoms. These cores signify that the disease has run its course. They are not uncommon in chickens in good health. When the core is covered by skin-like material and the interior of it is reddish and crumbly, it is probably due to coccidiosis.

The chronic type of the disease which affects older birds develops slowly and may only affect a few birds in a flock. The outward symptoms are loss of appetite, roughened, dirty plumage, gradual loss of flesh, paleness of the comb and wattles, stilty movements, paralysis of the legs.

The disease in this form is very easily confused with many other poultry ailments, and the symptoms shown are similar to those caused by other poultry parasites. Post mortem examination will reveal that lesions are usually confined to the small intestine. The intestinal walls become somewhat thickened, and the lining has a spongy appearance. In severe cases red blotches may be present. The cæca rarely show any change.

Treatment.

Medicinal treatment has been found to be of little value, therefore preventive methods must be adopted and, in outbreaks, the worst cases destroyed. As the general stamina of the chickens is the best safeguard against any disease, it is essential that the chicks should receive the best care, attention, and feeding. Also, as the parasite in the oöcyst stage is harmless, and sporulation is only possible where the favourable conditions of moisture and warmth prevail, brooder houses should be as free from dampness as possible. The congested conditions under which chickens are reared naturally lead to foul pens and brooders, making them a hot-bed of infection. In conjunction with the fact that two days must elapse for the oöcyst to permit of sporulation, it can be readily understood that by thorough cleaning daily, and frequent disinfection, the disease may be controlled. The practice of scattering grain in the runs, very desirable as a rule, should be discontinued when the disease is present. Grain and all food should be fed in receptacles that can be cleaned once or twice daily. Drinking vessels should be placed off the floor on frames that will prevent the access to moist places by the chicks.

Outbreaks can be controlled by the feeding of buttermilk powder, or fresh skim milk, but without the application of strict sanitary measures in conjunction with the milk diet success in the control of this disease cannot be expected. Where fresh skim milk is available this can be used as the only form of drink. Buttermilk powder may be used solely for twelve to twenty-four hours in cases of severe outbreaks, after which it may form 20 per cent. of the mash, until the disease is checked. This period may last from three to six days. The buttermilk can be then reduced to 10 per cent.

Buttermilk powder not only has curative properties in connection with coccidiosis, but it is a splendid food for both laying and growing stock, particularly so with young chicks. Poultry raisers could make this food form a definite portion of all mashes. With the use of 10 per cent. buttermilk in the mash no other form of protein is required.

The feeding of milk in any form has a tendency to cause the droppings to become very liquid in nature and, consequently, more frequent cleaning is necessary.

THE JOURNAL APPRECIATED.

A Mackay farmer, renewing his subscription, writes (15th August, 1930): "I am very pleased to have such a journal because of the advice and information it contains, and of its general sound policy for the betterment of the farming industry."

RETIREMENT OF MR. H. W. MOBSBY.

An interesting function took place in the office of the Minister for Agriculture and Stock on 20th August, when a large gathering of officers, representatives of all sections of the Department, attended an official farewell to Mr. H. W. Mobsby, F.R.G.S., F.R.S.A., Artist and Photographer of the Department, on his retirement from the public service.

The Minister (Hon. H. F. Walker), in presenting a wallet of notes to Mr. Mobsby as a token of the esteem in which he was held by his fellow-officers, referred to his long and faithful services, extending over a period of more than thirty-one years, during which term he was attached mainly to the Department of Agriculture and Stock, but for a limited time to the Chief Secretary's Department and the Intelligence and Tourist Bureau.

PLATE 105.—MR. H. W. MOBSBY, F.R.G.S.

The Minister spoke in eulogistic terms of Mr. Mobsby's work in connection with photographic art, which was recognised throughout Australia and overseas, and pointed out that he had been a great asset in placing before the world in photographic and other forms the attractions of his State. He also recalled Mr. Mobsby's services as official representative at the Franco-British Exhibition, the Panama Exposition, the British Empire Exhibition, and the Dunedin Exhibition, and added that he had also effectively represented the State at Exhibitions in metropolitan centres in the other States. Mr. Mobsby had the good fortune to also accompany high dignitaries through Queensland, amongst whom were the Prince of Wales and the Duke of York.

The Minister assured Mr. Mobsby that he left the Department to enjoy an honourable period of retirement with the goodwill and best wishes of every member of it.

Messrs. E. Graham (Under Secretary), H. T. Easterby (Director, Bureau of Sugar Experiment Stations), J. P. Orr (Registrar, Primary Producers' Organisations), and T. C. Troedson (Intelligence and Tourist Bureau), supplemented the Minister's remarks.

Mr. Mobsby, in reply, feelingly expressed his thanks for the good wishes and the tangible token of esteem presented by his fellow officers, and referred to various incidents which had occurred during his visits abroad as Departmental representative at overseas exhibitions. Addressing the younger officers directly, he said that nothing was ever denied to well directed diligence. He counselled them to give of their best to the world and the best would return to them. Good enough was not good enough—Australia must have the best.

A NOTABLE CAREER.

A native of Brighton, England, Mr. Mobsby was educated at Hampton Place High School, in his home city. It was as a lad that Mr. Mobsby got his first taste of exhibition work, when he accompanied his father in his official capacity to the Agricultural Exhibition held on the Goldsmid Estate, Hove, Brighton, England. He studied art and design at the School of Arts, Brighton, and decorative art under Mr. A. G. Greysmith, artist, of London and Brighton. His first personal connection with any exhibition was when he assisted Mr. Greysmith at the Heatheries at the Royal Pavilion Building, Brighton.

After studying chemistry and following a course of general commercial training he left England for Brisbane in 1883, accompanying Mr. W. Jenner, the well-known artist, and his family, Mrs. Mobsby being the eldest daughter of the late Mr. Jenner.

Mr. Mobsby was for some years a member of the teaching staff in decorative art and lettering at the Brisbane Technical College when Mr. D. R. McConnel was director.

Since 1897 he has been attached to the Department of Agriculture and Stock, Brisbane, as Government artist and photographer, and it is during that period that he became so closely connected with this State's interests at the Australian Natives' Association Exhibitions at Melbourne for several successive years, also at Adelaide and Sydney and at the Royal National Show at Brisbane each year. In 1908-9 Mr. Mobsby designed the Queensland Court at the Franco-British Exhibition, and travelled as State representative to London with the late J. M. Campbell to supervise the construction of the lay-out, design trophies, and colour scheme.

While in England he exhibited Queensland products at Newcastle, Lincolnshire, Gloucestershire, also at Aberdeen in Scotland and Dublin, in Ireland. When Sir H. Tozer was Agent-General he transposed Gattis Restuarant, in the Strand, to the present Agency-General, supervising fitting up, furnishing, and laying out the first display of Queensland products in London.

It was while Mr. Mobsby was at the Franco-British Exhibition he was instrumental in raising £166 8s. 2d. in pennies at the Saturday Hospital Fund, which enabled a Queensland cot to be established in the Queen Alexandra Hospital.

The year 1915 saw him again designing and supervising Queensland's Court at the Panama-Pacific Exposition at San Francisco, United States of America, the late J. A. Robertson being Queensland Commissioner, who before the closing retired from the position, and Mr. Mobsby was appointed Acting Commissioner in Charge by the Queensland Government. He was also appointed by the authorities of the Panama-Pacific International Exposition to act on the jury of awards in the wine section, for which he was awarded a medal for special services. While in America Mr. Mobsby gained a diploma and medal for photography, also certificate of efficiency in motion picture work.

After carrying out Australian Natives' Association Exhibitions at Melbourne and the Peace Exhibition at Adelaide, Mr. Mobsby was in 1924 appointed by the Government on the Wembley Commission as State organiser for the Exhibition at Wembley, England. He then went to London by appointment of the Federal Government as display officer at the Wembley Exhibition. At the intervals between exhibitions Mr. Mobsby visited all parts of the State as the official photographer, obtaining pictures of the industries associated with his Department, also scenic pictures which have been used for technical and other publications and lectures all over the world, as well as supplying the Tourist Bureau with pictures in advertising Queensland's productive wealth and scenery, also Departmental record and specimen work in animal and plant pathology by ordinary and micro-photography.

In 1925-26 Mr. Mobsby was appointed by the Government to organise and design the Queensland Court at the New Zealand and South Seas Exhibition at Dunedin, New

Zealand, and afterwards supervised the construction, and was Queensland's representative in charge during the currency of the Exhibition. The display was awarded a gold medal and diploma.

That Mr. Mobsby has not held these positions except on merit is proved by the fact that he holds a number of diplomas, certificates, and fellowships which have been gained in fields which have fitted him for his work, amongst which may be mentioned: Fellow Royal Geographical Society; Senior Diploma Chamber of Commerce, England; Senior Diploma City and Guilds, London; Senior Diploma Cripplegate Institute, London, each for theoretical and practical photography; Medallist World's Photo. Competition; and Fellow of the Royal Society of Artists. He is also honorary lanternist to the Royal Geographical Society of Queensland.

Mr. Mobsby made many friends in his travels overseas and in Australia, where, by his experience and artistic taste, his work has been much appreciated to the benefit of Queensland generally, also in the information obtained and reported to his State and which was afterwards used in extending the State's commercial enterprise overseas. He has been personally instrumental in securing valuable settlers for Queensland, and generally he has given of his best to the service of his adopted State.

On the lecture platform he is also well known, and as a valued public officer he will be very difficult to replace. As a contributor to the "Queensland Agricultural Journal," both by picture and pen, Mr. Mobsby has earned the high appreciation of our readers, everyone of whom will wish him well in the years of his honourable retirement after a lifetime of public service.

PLANT BREEDING AT ROMA STATE FARM.

By R. E. SOUTTER, Manager, Roma State Farm.

WHEAT.

WORK in connection with this crop was taken up in 1907 and has been carried out continuously ever since. During the period which has elapsed innumerable crosses have been made, only a very few of which have produced selections of sufficient merit to warrant their being distributed amongst the farming community, the names of the most favoured of these being Cedric, Duke of York, Flora, Novo, Three Seas, Warchief, and Watchman.

Cedric.

A result of crossing Cedar and Bunge. This selection, which is red grained, hardy, and fairly rust-resistant, yielded 30 bushels to the acre two years in succession in the variety trials. It was distributed among wheatgrowers and has been grown fairly extensively ever since.

Duke of York.

A selection from (Cretan x Bunge) x Gluyas. The cross was made with a view to embodying the rust-resisting, drought-withstanding, and yielding capabilities of the Gluyas with the upstanding habit and rust resistance of the Cretan-Bunge selection. Although susceptible to flag smut, the objects, in a great measure, were achieved, and to-day the variety is favoured by quite a few farmers on the Downs.

In 1928 it was awarded second place in the Toowoomba district competition and third in the Grand Champion.

In 1929 it gained first and second place in the Toowoomba district, came second in the Warwick, and won the Grand Championship, and was also the only crop which secured full points for evenness.

Flora.

A selection from Bobs x Florence, the object being to evolve a selection with the fine milling qualities of Bobs in combination with the resistance to smut and other desirable characteristics of the Florence variety.

Smut resistance was not secured in this selection, but the grain is of pleasing appearance, straw is of medium length, fairly hardy, and rust-escaping, and, although not a heavy yielder, is favoured by a few growers on account of consistency.

Novo.

A Bunge-Indian Pearl cross; a very suitable variety for dry localities; is grown fairly extensively in the Maranoa and parts of the Downs, more particularly Allora, where a yield of 42 bushels to the acre has been obtained. Straw is inclined to be a little weak; escapes rust if sown as a main crop, and produces a grain of good appearance.

Three Seas.

(Cretan x Comeback) x Comeback. The object of this cross was to produce a wheat of good milling quality with a high degree of rust resistance. This latter object was attained, for, during a rust visitation some few years ago it proved to be least infected or affected of all the varieties and selections under observation. It further demonstrated its resistance on the Downs by producing a summer crop of eight bags when varieties like Florence grown alongside were absolutely rendered worthless. Being a bearded variety with a soft grain susceptible to weevil infestation precludes it from being recommended extensively, but some very promising crosses, bald, and early and late in habit, with a good, hard grain, have been under observation for some time, but until their degree of rust resistance has been determined they cannot be distributed.

Warchief.

Soutter's Early x Warren. Same breeding as Watchman, with the field characteristics of Warren—that is, late, good rust resister, hardy, but the grain is of better quality. Was and probably is still grown in some localities in preference to Warren, which variety produced crops heavily infested with loose smut a few years ago. Warchief is suitable for early sowing for hay, grain, or grazing.

Watchman.

This is a selection resulting from crossing Soutter's Early and Warren. The object in making this cross was in an endeavour to combine the earliness and quality of the grain of the former with the rust-resisting, stooling qualities, hardiness, and palatability to stock of the latter. With the exception of some of the more recent crossbreds under observation, this is the earliest variety we have, is extremely hardy, escapes rust. Its hardiness may be gauged from the fact that it is capable of producing a crop of nice, plump grain under conditions fatal to many of the slow-growing varieties.

In 1928, sown in June first, harvested October third week, on a rainfall during the growing period of 234 points, it yielded 25.6 bushels to the acre, whilst in 1929, sown in June and harvested in October, on a rainfall during the growing period of 70 points, it returned nearly 15 bushels to the acre.

The method adopted in connection with the initial operations of crossing varieties are practically the same everywhere, special care being taken to prevent the introduction of foreign pollen when emasculating when pollenising and immediately after.

Although reciprocal crosses are frequently made, it is usual to select as the male parent the individual with the most pronounced dominant characteristics, such as baldness, red chaff, pubescent glumes, &c., so that the intrusion of foreign pollen is more readily discernible in resulting plants. The grains produced are put into containers showing parentage, when cross was made, and harvested, &c.

In the following season these grains are sown in a situation well away from fences and trees and wholly surrounded by early-sown crops so that the chance of injury by birds, &c., is reduced to a minimum.

In all the preliminary work here the grains are sown from 10 to 12 inches apart in the rows, with rows 2 feet apart. This procedure is absolutely essential under our conditions, where the rainfall has to be wholly depended upon to bring the plants to maturity, permitting as it does of inter-row cultivation, thereby enabling full use to be made of the soil moisture by preventing loss through evaporation and foreign growth.

With this system of sowing we have not had a break in the work. By this is meant that the sowings have always provided sufficient seed to carry on, notwithstanding that field crops sown on adjacent plots on similar soil prepared in the same manner have practically failed on more than one occasion.

Last year, on a rainfall of 70 points during the growing period (1st May to 10th October), some of the drills in this section yielded from 14- to 25-bushel rate per acre, whereas in another section, where the drills were 10 inches apart and plants more closely in the rows, on the same class of soil with the same working the yields ranged the rate of 2 to 12 bushels per acre.

When harvesting the grain of the conjugate plants all weak-constitutioned plants are eliminated, and, although not necessary, the grain from the individual plants is saved separately for sowing the next season.

The year following selections are made of those plants of good promise.

In the next season fixed types having desirable field characteristics are selected for further sowing, and further selections made of desirable types met with in unfixed rows.

The following season fixed types selected last year deemed worthy of further trial are tested in chain drills at the farm and by the officers of the Field Branch on the several farmers' plots, so that their behaviour under varying conditions on different types of soil as well as their susceptibility or otherwise to the prevailing kinds of rust may be more readily ascertained.

These sowings are usually made with a seed drill at the rate of a half bushel to acre, drills 2 feet 6 inches apart, with every fifth row sown with the standard variety of the district on soil worked according to instructions received from the Field Branch. Notes as to behaviour and yields recorded at the Farm and by officers, Field Branch.

The next sowing includes all those possessing desirable characteristics. They are sown in the same manner and in the same locations as in the previous season.

The next year the work is practically a repetition of the two previous—elimination of undesirables—but extended areas of any very outstanding selections are sown.

The following year the very few which have proved themselves to be rust-resistant, hardy, with desirable field characteristics, of good milling quality, and better yielders than the standard varieties, are sown in extended areas.

The adoption of the system employed at the Minnesota Station in connection with "Grain Improvement" is being considered. In fact, last season a step in this direction was made, but owing to the very adverse conditions the results were not satisfactory and seem to indicate that the methods adopted in connection with sowing them will have to be altered to meet the conditions here.

BARLEY.

Not very much has been done with this crop. In 1917 a skinless barley was crossed with a two-rowed type, more for the purpose of studying the inheritance of characteristics than anything else.

Resulting from this crop we have half a dozen very promising selections from a green feed or grain-producting standpoint.

Their suitability or otherwise for malting purposes has not been ascertained.

With the exception of the treatment received by the florets when emasculating, the methods employed in evolving a barley variety are similar to those adopted in connection with wheat.

COTTON.

Work in connection with this crop was commenced in 1923, and consisted in testing a number of plants selected on account of their productiveness.

The lint resulting from sowing the seed of these selections was submitted to the Chief Cotton Grader to report upon, with the result that two selections were returned as being worthy of continuing with, one of which is still under observation.

In 1925 selections were made of an Okra-leafed type of cotton found growing in a crop of Durango, for the reason that it was considered possible that this type of foliage might result in the plants being more drought-resistant in a dry climate, less susceptible to disease in a wet, facilitate picking by hand, and afford less impediment to mechanical pickers.

At the present time we have the following under observation:—

3 Okra-leafed selections	⊕	(selfed).
1 Dwarf Durango	⊕	(selfed).
2 Durango sel.	⊕	(selfed).
3 Tall Durango	⊕	(selfed).
1 Variegated Durango	⊕	(selfed).
1 Clean Seed Durango	⊕	(selfed).
1 Okra leaf sel.	⊕	(selfed).
1 Brown seed	⊕	(selfed).
1 Green x Variegated		(selfed).

Progress is slow with this crop owing to the fact that the last two years sufficient rain to sow on has not been experienced until the summer was well advanced, the insect injuries very great, with the result that very little seed has been produced.

Last year a little black beetle appeared whose habits necessitated the covering of any flowers with paper covers where pollen contamination was not desired. Such covering in this climate brings about a sweating resulting in the shedding of many of the flowers.

COWPEAS.

Work with this crop was commenced in 1913, the idea being to evolve, if possible, quick-growing varieties for green manuring purposes, erect growing, kinds suitable for mowing with machinery for conserving in the form of hay or silage, combined with a non-susceptibility to nematode, and improved seed production.

Three selections resulting from this initial work have been grown here on soil heavily infested with nematode for a number of years. Seeds of these have also been distributed outside. More recently attention has been directed to the evolving of nematode-resistant types of several of the best existing varieties as well as the production of fine-growing varieties for conserving in the form of hay and heavy-seeding varieties, which latter kind it is hoped will supply the deficiency in proteins in the pasture in the winter and spring in the same manner as the sheep man is assisted in Western Australia by the lupin in the summer.

It is found that large-seeded varieties produce plants which, during the first two or three weeks of their existence, are much better able to contend with adverse circumstances than those emanating from small seeds. More particularly does this apply to sowings germinating late in the spring on light, sandy soils inclined to blow.

Progress with this crop is rapid, for, with an early germination in the spring, investigations can be carried out with two generations in the one season.

The method adopted in connection with sowing here is as follows:—

Spring sowing.—Three or four seeds are placed in hills 6 feet apart in rows with rows 12 feet apart. Thinned out to individual plants when coming into the 5 feet or 6 feet leaf.

Second sowing (middle January).—Three or four seeds in hills 6 feet apart with rows 6 feet apart.

It has been found that dark-coloured beans are not so susceptible to attack by weevil as the lighter coloured.

Notwithstanding the adverse conditions, we have under observation and looking well sixty-two selections from the following crosses, viz.:—

(Skewbald x Large White) x Californian Black and White.

Large White x Skewbald x Mammoth.

Poonah x New Era x Mammoth.

Home Hill Clay x Poonah Selection.

Home Hill x Mammoth.

Large White x Skewbald x Californian B. and W. x Skewbald.

((Large White x Skew) x C.B. and W.) x Californian B and W.

Snake x Poonah.

Poonah Selection.

Snake x Poonah x Californian B. and White.

PUMPKINS.

A few crosses have been made and are being followed up, but the stabilisation of a strain or strains of the so-called Beaudesert Pumpkin is the chief concern at present. Progress has been much hampered by adverse seasons and the presence of nematode in the soil.

The method adopted in connection with pollination is as follows:—

If selfing is to be practised, the evening before the flowers open a string is put round each of them, a male and female, if possible on the same runner, and drawn sufficiently tight to prevent opening. In the morning the string, which, by the way, should have been put on close to the point of the flower, if further tightened cuts off the top of the flower, exposing the male or female organs as the case may be. If the morning is bright, in the male flower, which should be the first treated in this way, it will be observed that the anthers have dehisced and a lot of loose pollen has collected at the base. By careful breaking back the corolla, but so as to still retain the pollen, it can be made sufficiently small to permit of its introduction to the reproductive organs of the female flower without undue interference to its corolla, which is essential, as this has to be again tied up after the operation to prevent contamination by foreign pollen through insect or other agencies.

OTHER CROPS.

Field Peas.

The dry winters experienced here are not as favourable for the development of this crop as in the Southern States or more favoured portions of Queensland. Nevertheless a fair amount has been accomplished since 1924 when the work was first taken up, and at present some ten promising selections resulting from crossing Paragon (Field Pea) and Improved Stratagem are under observation.

Soudan Grass.

Work in connection with this crop was commenced in 1920, consisting chiefly in isolating several strains, some of which appeared to be the result of sorghum crossing, and having them tested by the Agricultural Chemist in order to ascertain their suitability for stock at varying stages in their growth under varying conditions.

Unfortunately, owing to a run of adverse seasons and the lack of conveniences for watering, the results were lost, only one strain being saved, which is under observation this season.

Citrus Fruits.

At present we have under observation twenty budded trees mostly "grape" fruit crosses made in 1923.

In order to expedite this work as soon as the seedlings are large enough to furnish buds so are they budded on to suitable stocks.

This section of the work has also suffered owing to lack of water, a number of crosses in which the Washington Navel orange was the female parent having been lost.

Grapes.

Crossing was first done in 1920, and a number have been made since with the result that at present there are two or three rather promising plants under observation.

Owing to the time which must elapse before a seedling gives a reliable showing on its own stock, grafting is to be the practice in future.

As some of our own seedlings appear to be little affected by nematode, more especially those resulting from crossing Cinsant with Rupestris, they are to be used as the stocks.

The crosses have been many and varied, but as with other crops, owing to the unfavourable conditions and lack of facilities for watering more plants have died than have matured.

One of the original crosses affords a most wonderful illustration of "heterosis."

It was put out in a row of vines where one had died which had been planted twenty years previously. The whole row of the vines at the time looked sickly, the most robust not producing wood more than 6 feet in length and very spindly at that. Last season the seedling produced many shoots over 30 feet in length of a stoutness in proportion and a fair crop of fruit.

Peanuts.

No crossing has been attempted in connection with this crop, but all varieties are being tested. Plan of 1929 sowing follows.

Different kinds of pegs are used for marking the positions of the emasculated and pollinated flowers in the field. When fecundation has been accomplished oiled labels are attached on which appears the cross made, parentage, &c., and when made. This and any other notes are recorded in field book.

Border Row.

Range 9.	5	6	7	8	9	10	0	1	2	3	4
Range 8.	3	4	5	6	7	8	9	10	0	1	2
Range 7.	1	2	3	4	5	6	7	8	9	10	0
Range 6.	10	0	1	2	3	4	5	6	7	8	9
Range 5.	8	9	10	0	1	2	3	4	5	6	7
Range 4.	6	7	8	9	10	0	1	2	3	4	5
Range 3.	4	5	6	7	8	9	10	0	1	2	3
Range 2.	2	3	4	5	6	7	8	9	10	0	1
Range 1.	0	1	2	3	4	5	6	7	8	9	10

Border Row.

Rows 4 feet apart.

Plants 2 feet apart.

Fifteen plants to row.

Thirteen used to determine yield.

Varieties O.

0. Office Threes
1. Wilson's Sel. 1
2. Wilson's Sel. 2
3. Wilson's Sel. 3
4. Wilson's Sel. 4
5. Wilson's Sel. 5
6. Wilson's Sel. 6
7. Wilson's Sel. 7
8. Wilson's Sel. 9
9. Wilson's Sel. 9
10. Wilson's Sel. 10

QUEENSLAND SHOW DATES.

Imbil: 3rd and 4th September.

Malanda: 5th and 6th September.

Gympie: 10th and 11th September.

Redcliffe: 12th and 13th September.

Noosa (Pomona): 17th and 18th Sept.

Beenleigh: 19th and 20th September.

Rocklea: 27th September.

Esk Campdraft: 26th and 27th September.

Kenilworth: 27th September.

Southport: 3rd and 4th October.

Enoggera: 4th October.

Nerang: 10th October.

TOBACCO GROWING IN NORTH QUEENSLAND.

MINISTERIAL ANNOUNCEMENT.

THE Minister of Agriculture and Stock, Hon. Harry F. Walker, has announced that for the past three years experiments in tobacco growing have been carried out under the auspices of the Australian Tobacco Investigation Committee. This body, of which Mr. C. M. Slagg, M.S., is the Director, has carried on its work out of funds provided by the Commonwealth and State Governments conjointly with the British-Australian Tobacco Company, which company has substantially subsidised the project and has been largely instrumental in the developments that have taken place. Experimental plots have been tested under the direction of the Department of Agriculture and Stock in widely separated areas, ranging from Bowen to Mareeba in the north and to Pentland in the west. The problem to be solved was to find soils suitable for producing a bright tobacco, of good burning qualities and with an agreeable burning aroma, such as would prove acceptable to the cigarette and pipe-smoking public. The results of these experiments have so far proved eminently satisfactory. It has been established that such a tobacco can be produced on the poor granitic soils in the vicinity of Mareeba, in North Queensland. There is ample Crown land available there and the climatic conditions are suitable. The experiments have enabled the Department of Agriculture and Stock to lay down the right proportions of chemical plant foods required to be added to the soils to produce the class of tobacco which the market requires.

The annual Australian consumption of cigarette and pipe tobacco is about 20,000,000 lb. The British-Australian Tobacco Company has intimated that it will purchase all tobacco of the right quality grown in Queensland at remunerative prices.

A farmer, generally speaking, can cultivate and cure about 5 acres of tobacco with his own labour. The produce of an acre should not be less than about 500 lb. so that at, say, 2s. 6d. per lb. the gross return from an acre should be about £62 10s., The price mentioned is an arbitrary one and must not be regarded as in any way being a guaranteed one.

Farms at Mareeba.

The Government is convinced that an important industry can be secured for North Queensland by the encouragement of tobacco growing in the Mareeba district. The prospects of the development of the industry have been investigated by the State Consultation Committee on Developmental Proposals which has recommended to the Government that thirty tobacco farms, near Mareeba, be made available to approved applicants for cultivation under tobacco during the coming season which lasts from December to March.

Accordingly instructions have been given to a surveyor and an officer of the Department of Agriculture and Stock, experienced in the results of the tobacco experiments, to design thirty tobacco farms in the locality mentioned. Each farm will have about 60 acres of arable land suitable for tobacco and an area of grazing land up to 200 acres wherever practicable. As the quality of the land is poor it must be definitely stated that the possibility of a farmer making a living out of anything but tobacco is remote.

Land Available.

It is expected that the design of the farms will be available almost immediately. If the land is to be ready for cultivation by December it will be necessary for the successful applicants to get on to their farms immediately in order to clear, stump, and cultivate 5 acres for planting in December.

So that there shall be no delay the Government has arranged with the Land Administration Board to open the farms for Agricultural Homestead Selection under the group system at a purchasing price of 2s. 6d. per acre. Opening under the group system involves the allotting of the lands to successful applicants before the lands are formally opened. It also involves personal residence on the farms on the part of the selectors. Each successful applicant will be required to enter on his farm forthwith and proceed with the clearing and stumping of 5 acres.

Experienced Men Preferred.

Applications, which closed on 31st August, have been received from persons desirous of competing for inclusion as members of the group to which the farms will be allotted. In allotting the farms preference will be given to persons who have had farming (preferably tobacco-growing) experience, who have sufficient capital to carry them on for a year or two, and who will undertake to cultivate

5 acres under tobacco during the coming season from December to February. Each applicant should therefore include in his application particulars of his qualifications under these headings.

Each successful applicant will be assured of the utmost assistance of the officers of the Department of Agriculture and Stock who are versed in the cultivation and treatment of tobacco. These officers will give advice regarding the growing and curing of the tobacco crop.

The Government intends from time to time to make further tobacco farms available to the public.

An important feature of the prospective tobacco growing industry is that the growing period coincides with the slack season in the North Queensland meat and sugar industries and thus ample labour will be available.

TOMATO GROWING IN NORTH QUEENSLAND.

By E. F. DUFFY, Instructor in Fruit Culture.

The principal area for the production of tomatoes for the Southern markets extends from Langford Creek to Wakala, with the main production in the delta of the Don River, at Bowen.

Farmers at the Proserpine districts and also on the delta of the Burdekin River are going in for this crop. Planting begins in January with the first early plot, and go on to May and June for the late crops. Staking of the plants is not at all practised. The plants are put out at distances of 9 by 9 feet, and in some instances further apart. When grown under good conditions the plants cover the whole of the intervening spaces. The Bowen Buckeye, Livingstone Glove, and Burwood Prize are varieties which have mostly been grown. First place is given to the Buckeye variety. Generally speaking, there is an absence of fungoid troubles which attack tomatoes in other districts, nor do they suffer from wet rot which causes so much trouble in other districts where more frequent and higher rainfalls occur.

Consignments carry to Melbourne and Adelaide without losses and in satisfactory condition. A good start with the areas is always achieved during the summer rains, and with the subsequent winter rain which can be generally depended on, good harvesting goes on to October and November.

One of the greatest pests in all light soils is the nematodes which cause the failing or knotting of the roots.

Many of the growers resort to the making of a good log fire on the ground where the seed-beds are to be made.

This presents itself as a good, ready means of destroying the nematodes and thereby giving the young plants a clean start, and also of cleaning the ground of fungus which may cause damping off, or the verticillium fungus which attacks the young plants.

Sterilisation of the beds with formalin is also to be recommended for the achievement of this purpose. The other pest which causes so much heavy losses in tomato growing generally is the larvæ of the Heliothus moth.

If growers would spray or dust the young beds twice before moving the plants with a combined arsenate of lead and Bordeaux preparation, and also do the same three times at intervals after planting out up to the setting of the first fruit, and gather all affected fruit both large and small during the first two "skim" pickings, a big control of this pest would be kept.

The eggs are laid on the young bushes and the larvæ feed on them, and subsequently the eggs are laid on the base of the flowers and on emergence of the young larvæ they bore straight into the young fruit. It is therefore apparent that control measures taken as above would check the subsequent multiplication later on.

Care should be taken in the dying of the young plants in the seed-beds, so that as little damage as possible is done to the roots of the plants, and thereby prevent as much as possible entrance of the fusarium fungus which is responsible for wilt.

The necessity, of course, arises for the application of a complete manure on land which has been under the crop year after year, and the ploughing-in of a green crop when possible for the keeping of a sufficient supply of humus and nitrogen in the soil. Legumes were considered most suitable for the purpose, but as they serve to perpetuate nematodes, other green crops are resorted to and, amongst these, maize (broadcasted) provides, when ploughed in before reaching its maximum growth, a good supply of humus, the nitrogen being applied in concentrated form preferably before sowing the maize.

FRUITGROWING AT HERBERTON.

Mr. C. Harding, who is well known in horticultural circles in the North, has supplied the following notes on his twenty years' experience in fruitgrowing in the Herberton district:—

Locality: Three miles south from town of Herberton.

Temperature: As much as 16 to 18 degrees of frost, followed by a dry spring.

Soil: River flats. With the exception of grapes, no results were obtained until a liberal quantity of lime was applied. Trees blossomed, but the fruit did not set.

Grapes do well, both on the alluvial river flats and red volcanic soil. I suggest manuring with an artificial manure comprising 10 per cent. of potash. This is a great factor in producing a sweet grape. Varieties: Gotha, Ferdinand de Lessep. These varieties were sent to the district twenty years ago by Mr. A. H. Benson. Many others do well, but the grower's object should be a grape that will stand transit and the thunderstorms. The Wilder Isobel and White Portugal are good main crop grapes.

Plums were shy bearers until the trees assimilated the lime, at first only bearing twenty to thirty fruit. The next year they bore from one to two hundred, while this year they are carrying up to two hundred dozen or more per tree. I strongly recommend the Kelsey—an exquisite and luscious fruit, readily saleable at 1s. per lb. Fruit weighing 6 oz. have been picked this season. Other varieties tried were Red Heart and Satsuma. They bear good crops of fruit, but from a quality point of view are not in it with the Kelsey. These are protected from the fruit-fly with netting.

Apricots are strongly recommended, especially all the early varieties including Moor Park and New Castle. The beauty of this fruit is that it matures before the fruit-fly becomes active, being ripe the second week in November, and no protection is required.

Pears are now being tried and will be a success. Those tried and now bearing heavily are Keifeers and Hybrid. The higher class of fruit is doing well.

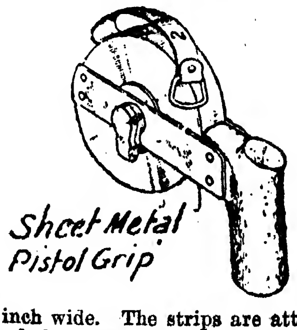
Persimmons do exceptionally well, and the trees are heavily laden every year. Both early and late Japanese varieties are recommended.

Two Pecan nut trees were sent to the locality twenty-five years ago by Mr. A. H. Benson; they are now 30 feet high and bearing good crops.

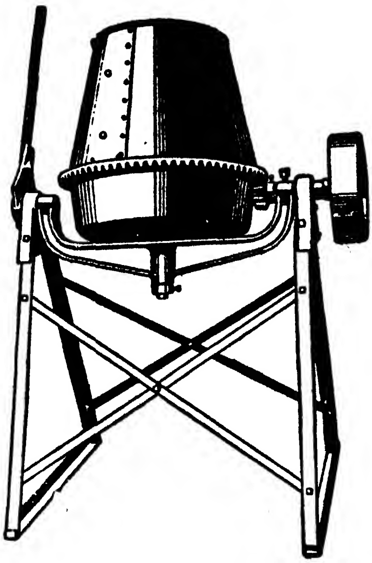
All trees should be given a liberal supply of water at the end of July and August. To be successful it is essential that trees be kept clean, and attention must be paid to the use of appropriate fertilisers. These remarks only apply to this particular locality. Growers must experiment and get varieties of fruit suitable to their localities. My experience will not allow me to recommend apples.

HANDY TAPE GRIP.

The tape commonly used by surveyors is hard to hold, especially when the hands are cold. The sketch shows a pistol grip that was cut from a tree branch. It measures about ¾ inch in diameter, and is attached to the reel case by means of



two strips of sheet metal, ⅝ inch wide. The strips are attached to the case by rivets, which pass through the rim of the case so that they are not in the way of the tape. Two rivets secure the strips to the handle. The grip is especially handy in unwinding or rolling the tape.



THE CARE OF THE CAR.

THE motor car battery consists essentially of a number of cells, three in the case of a 6-volt battery and six in the case of a 12-volt battery. These cells are usually contained in a common box, but each cell is a separate compartment from its neighbour.

Each cell has a non-metallic tank, usually a rubber compound. This cell contains a liquid known as the electrolyte and a number of positive and negative plates. The positive plates are connected to the positive terminal on the top of the cell and the negative to the negative terminal. The plates are made of specially cast lead that has been covered with special pastes of lead oxide. To understand the chemical actions in which these plates are involved, a knowledge of electro-chemistry would be required, which is something the average motorist does not possess, nor would it be of any great practical value to him if he did. The lead plates are so made that they present a large surface for the active material or paste to adhere to. The main constituent of the positive plate paste is red lead, while that of the negative plate is litharge. In the process of making the battery elecric currents are passed through these plates but, ultimately, when the battery is supplied to the motorist it is fully charged and the positive plate presents a grey appearance (it has an outer layer of spongy lead), whereas the negative plate has a dark chocolate-brown appearance (its outer layer is of lead peroxide).

The electrolyte is sulphuric acid diluted with the purest of water, that is, distilled water. The strength of this solution of acid and water is of vital importance to the operation of the battery. Sulphuric acid is considerably heavier than water so that the strength of a mixture of the two may be judged by the weight of the mixture as compared with the weight of an equal quantity of water. This comparative figure is known as the specific gravity. Water is taken as the standard and thus if the specific gravity of a liquid be given as 1.5 then that liquid is 1½ times as heavy as water.

The specific gravity is measured by a simple instrument known as an hydrometer, which is really only a calibrated glass rod weighted at one end. When this rod is floated in a liquid the depth to which it will sink will depend upon the density of the liquid, so that it is a simple matter to calibrate the rod to measure specific gravity. Sulphuric acid consists of hydrogen and a combination of oxygen and sulphur, which is known as sulphate. Now when a battery is fully charged all the sulphatae is in the electrolyte, whereas when the battery discharges the sulphate is removed from the electrolyte and combines with the lead on th plates to form lead sulphate on both plates. When the battery is fully discharged all the sulphate is removed from the battery and the electrolyte becomes practically water.

Care of the Battery.

The plates of the battery should never be left for any length of time exposed to the atmosphere, and as the water in the electrolyte evaporates it must be made up from time to time or the plates will not be kept covered. Only distilled water should be used when making up the battery, and this distilled water should never be stored in a metallic container, as a trace of metal in the water will cause chemical actions in the battery, which will greatly shorten its life. The electrolyte level should be kept about an eighth of an inch above the tops of the plates.

A battery should never be left for any length of time discharged, as the lead sulphate on the plates forms into crystals, which will not disintegrate when an effort is made to recharge the battery. This happening is known as sulphation of the plates, and is a cause of the partial destruction of many batteries. Thus, if the driver knows that his battery is "flat" or nearly so, he should see to it that the battery is charged before the car is left idle for a few days.

Prolonged use of the starter when the engine will not start has a most injurious effect upon the battery, as the excessive current taken from the battery causes it to overheat and the plates are buckled. Also the sudden chemical action that occurs cracks up the lead sulphate and some of it drops to the bottom, where it is useless or possibly even a nuisance. If an engine does not start readily there is always some good reason for it, and it is a very poor driver who just keeps his foot on the starter and hopes for the best. The good driver only keeps the starter button pressed for three or four seconds, and if the engine has not then started he will look for the cause of the trouble. When a battery is fully charged the hydrometer will register between 1.275 and 1.300, and the hydrometer reading should be checked when the distilled water is added. When the battery is discharged the hydromter reading will not be much more than 1.100. The number of times that a battery requires the

addition of distilled water varies with climatic conditions. As an example, in the hot, dry summers of the Western districts, the battery should be checked about once a week, whereas in cold weather, where the evaporation is very little, it is sufficient to check monthly.

The life of the battery depends very greatly upon the service to which it is subjected. As an example, the average country driver usually makes long trips, which means that the battery is charged for long periods, and that the starter is used but little. On the other hand, the city driver may use his starter very frequently, with the result that the battery is discharged much more rapidly than it is charged. When this is the case, the battery should be re-charged at a service station periodically. It is well to remember that the acid used in the battery is remarkably corrosive, and will destroy any clothing it touches, and will burn the skin and even ruin the eyesight should any of it be splashed in the face.—RADIATOR in "The Farmer and Settler."

ABSTRACTS AND REVIEWS.

The Pig Breeders' Annual.

By a recent mail there came to hand the 1930-31 edition, Volume 10, of the Pig Breeders' Annual, published by the National Pig Breeders' Association, the largest and most representative stud pig-breeding society in Great Britain. Published in England and available to readers here at 3s. 6d., post free, the Annual represents excellent value, and should appeal equally to all who have an interest in pig breeding and feeding, no matter what breed they keep or in what country they reside. Breeding, feeding, management, marketing, and veterinary questions are dealt with by the most competent authorities, while the statistical section has been carfully revised and much valuable matter added. The illustrations of various breeds of pigs and of pigsty buildings and labour-saving appliances, together with the illustrated advertisements from a wide range of breeders, give to the volume added value from the point of view of the Australian farmer, while the reviews of pig breeding activities in various countries will be read with considerable interest by breeders anywhere.

The President of the Association this year is Major Clive Behrens, a prominent and successful farmer and an authority on all phases of the industry. The Foreword, by the Right Hon. Noel Buxton, M.P., late Minister of Agriculture and Fisheries, London, indicates the position of the pig industry in the Mother Country, and reviews the activities of different organisations specially interested in progress.

Articles of special interest to Australian breeders include, "The Future of Co-operative Bacon Factories in England," by David Black, Chairman of St. Edmundsbury Co-operative Bacon Factory, "Pig Prices," by Major E. R. Orme, of the Markets Division of the Ministry of Agriculture, "Common Ailments of Pigs," by Major C. G. Saunders, D.S.O., B.V.Sc., M.R.C.V.S., "Iodine in Pig Feeding," by Frank Ewart Corrie, B.Sc., M.D.A., N.D.D., "Litter Size, Is it Inherited?" by A. D. Buchanan Smith, M.A., M.S.A., B.Sc., of the Animal Breeding Research Department of the University of Edinburgh, "Observations of the Nutrition of Breeding Pigs," by those wellknown authorities, Dr. J. B. Orr, D.S.D., M.A., D.Sc., N.D.A., and H. R. Davidson, M.A., Department of Agriculture of the Rowett Research Institute, Aberdeen, "Empire Pork and Bacon," by E. H. Callow, Ph. D., B.Sc., A.I.C., "Experiences of Pig Testing in Scotland," "Dentition of Pigs," "The Work of the Harper-Adams Pig Feeding Experimental Station During 1929," "The Pig Industry and Young Farmers' Clubs," "Costs of Feeding on an Open Air Pig Farm," articles on "Pig Breeding Activities" in Sweden, in North America, in New Zealand, and "Pig Production as a Business," the latter by E. J. Shelton, H.D.A., of the Department of Agriculture and Stock, Brisbane, Queensland, Australia.

The volume is crammed full of useful facts and information of value to every farmer, and the Annual is worthy of a place in every library, and especially of those progressive farmers whose business it is to keep themselves abreast of the times and in touch with fellow breeders in every part of the world. The publication comes out under the general editorship of Mr. Alec Hobson, the Secretary of the National Pig Breeders' Association, a man of wide experience and unbounded enthusiasm. While the supply lasts, copies may be had on application to Mr. E. J. Shelton, H.D.A., Department of Agriculture and Stock, Brisbane, or from the Association's offices at 92 Gower street, London W.C.1, England.

The Young Farmer.

POINTS FOR CLUB MEMBERS.

Primary Essentials in Calf Feeding.

There are certain points to which too much importance can hardly be attached in the feeding of dairy calves. The first is the need for scrupulous cleanliness with the feeding vessels. The buckets should be scalded thoroughly every time they are used, and so also should any feeding apparatus used. The second is absolute regularity as to feeding time, and the third absolute uniformity as to temperature. Neglect of these last two points has more to do with calves' troubles than many farmers have any idea of.

A healthy regularity is likely to be promoted by feeding at the same time every day, while varying temperatures are obviously detrimental to the delicate and tender organs of the alimentary tract. Attention to the last is most necessary where a number of calves have to be fed or where the weather is particularly cold. Many very successful rearers of calves insist on having boiling water available during the whole time the calves are feeding, so that a little can be added as required to keep the milk ration up to blood heat.

As the calves grow they should be encouraged to eat as much roughage, such as hay or chaff, as possible. The effect is to develop the barrel and increase the capacity of the digestive organs for dealing with large quantities of food and turning it into milk. The development of the digestive organs can be begun with little difficulty while the animal is young, but it is practically impossible to modify the shape and conformation of a heifer that has been neglected up to the time she is, say, twelve months old.

Productivity of Dairy Cows—The Best by Test.

There is only one infallible judge of the productive capacity of dairy cows, and the wise dairy farmer refers for a verdict to the Babcock tester. There is too small a margin of profit in dairying nowadays to waste money and time in milking cows that do not yield sufficient to pay their way, or to take any risk in determining which come into this category.

Sheer human negligence perhaps is the main reason why farmers do not join a herd-recording unit, but there are still those who flatter themselves that they can tell what a cow produces merely on the animal's outward appearance, such as body formation, the size of the milk veins, and size and shape of the escutcheon. Judgments so based, however, have been repeatedly proved unsound, and the disparity between what the animal is estimated to produce and what she actually produces is frequently enormous. Valuable cows may as a consequence be got rid of, while fancy prices may, on the other hand, be paid for those not worth their salt.

There is one sufficient argument in favour of herd-recording—it pays. If it is used intelligently and systematically in conjunction with other means of herd improvement, the profit per cow can be very appreciably increased. Taking a dairy of forty cows, and estimating butter to the farmer at 1s. 6d. per lb., it will be seen that even a moderate increase in production per head has an appreciable effect on the farm income:—

Increase per cow.	Added farm income.
10 lb. butter	400 lb.—£30
20 lb. butter	800 lb.—£60
50 lb. butter	2,000 lb.—£150
120 lb. butter	4,800 lb.—£360

Every country in which dairying by modern methods is engaged in affords evidence of the benefits of herd-recording, but some striking enough figures are provided by our own farmers. Mr. E. P. Filmer, of Bimbaya (South Coast, New South Wales), recently furnished the information that as the result of eight or nine years' continuous recording he had been enabled to increase the average yield per cow from 180 lb. to just on 250 lb. of butter per annum, and this with a herd ranging from 95 to 100 head. A very simple calculation will show whether or not that improvement justified the expense of herd-recording, and the time and thought involved in the culling of the herd.

YOUNG FARMERS AT THE SHOW.

Twenty-five boys selected from the Schools Project Club of Queensland and ten representing the Junior Farmers' Clubs of New South Wales formed a farm boys' camp at the Exhibition Grounds, and thus was spent an instructive holiday at the Brisbane Show. Mr. T. L. Williams, who has been associated with the camp for three years on behalf of the Royal National Association, was again manager, and he had the valuable co-operation of Mr. G. M. Blacklock, manager of the Sydney contingent.

The lads were quartered on the grounds, and paid regular visits to different sections of the Exhibition. Several of the boys displayed a canny knowledge of cattle value, and largely anticipated the decisions of the judges with remarkable success.

In the John Reid hall the boys were taken in hand by Mr. M. P. Campbell, of the Chamber of Manufactures. Through the instrumentality of Mr. Campbell the Chamber of Manufactures had offered prizes of 30s. and 10s. for the best essay written by the boys of the Farm League on the exhibits in the John Reid hall. A similar prize had been offered by Messrs. C. F. Thompson and Co., bedding manufacturers, of South Brisbane, for an essay written by the boys on their particular exhibit.

Address by the Minister.

During a luncheon interval the boys were addressed by the Minister for Agriculture (Mr. H. F. Walker) on ideals of agriculture.

Mr. Walker said the lads had some hard work in front of them if they followed their avocations on the land, although those who worked hardest had the easiest time in the end. He said those on the land gained a freedom and independence of thought that was envied by those in other walks of life.

The Minister touched on many of the problems confronting primary producers, and said that in the early days some of the settlers worked and developed their land without much capital, and to-day were most prosperous.

"Queensland offers you great possibilities on the land," he added, "particularly in the Burnett areas, where cotton-growing is making rapid progress. We can grow tobacco here and save tremendous sums of money going out of the country each year. We also have wonderful opportunities of developing dairying and mixed farming, and following the splendid example last year, we can make a big increase in production."

The question of organised marketing was also explained to the lads, who were told that this would solve many of the farmers' problems.

The Boys.

Boys comprising the contingent included—Queensland:—Barrine, Charles B. Davis; Boonah Rural, Athol McLaughlin; Cloyna, Gordon Benson; Colinton, Anthony Peters; Eidsvold, Desmond Horn; Federal, Errol Head; Glencoe, Colin Storey; Gowrie Mountain, James A. Brimblecombe; Gundiah, Irwin White; Hatton Vale, Eric Knopke; Ideraway, Edward Gishford; Jarvisfield, Fred Ward; Jinghi Gully, Kenneth Sullivan; Killarney, Mervyn Hansen; Maleny, Harry P. Cranney; Mapleton, Ronald Pack; Mount Alford, Hector Stenzel; Palmwoods, Sidney Rann; Peeramon, George Imrie; Pimpama Island, Roy Wonders; Taabinga Village, Raymond Woodall; Tannymorel, Cyril Bull; The Caves, John White; Winya, Donald Fogg; Yamsion, Albert Koehler.

New South Wales:—Dorrigo, T. Harvey; Glen Innes, R. Berman; Kempsey, William Daley; Quirindi, George Williams; Singleton, Malcolm Shearer; Tenterfield, William G. Foster; Armidale, Owen Wallis; Tamworth, George Cook and Jim Meadows; and Scone, Roy Goodworth.

A FUND OF INFORMATION.

A Proserpine farmer writes (19th August, 1930):—"I am a regular subscriber to the "Queensland Agricultural Journal," for the man on the land it is a fund of information."

Answers to Correspondents.

Rotted versus "Green" Cow Manure.

C. T. K. (Scarness)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—The use of fresh cow manure or any excreta will encourage the growth of weeds. The farmyard manure properly prepared and matured by a process of fermentation and action of bacteria produces the plant foods in a better form, contains more nitrogen, and the vegetable matter is much more suitable for mixing with the soil, forming humus more readily, and encourages the growth of beneficial micro-organisms, &c. By the rotting process the vitality of the seeds is generally destroyed.

Roup.

J.A.L.S. (Barrine, N.Q.)—

From the symptoms described (combs turning black and a yellow discharge from the bird's throat), the disease appears to be a case of roup in one of its many forms. This disease could be prevented by keeping poultry under strict sanitary conditions, with ample ventilation, at the same time avoiding draughts, and with plenty of roosting space. A good germicide is obtained from the following mixture:—Dissolve 3 oz. of bluestone in a gallon of water. Dose: one cupful to each 4 gallons of drinking water daily. This germicide will prevent the disease from spreading from bird to bird through the medium of the drinking water.

Silage Requirements.

INQUIRER—

A herd of thirty cows will require 160 to 170 tons of silage if fed on it throughout the whole year.

A silo 12 feet diameter and 30 feet high will hold 68 tons; a silo 14 feet in diameter and 35 feet high will hold 117 tons.

It would require approximately 15 acres of green maize to fill the two.

Veterinary Questions Answered.

H.H.R. (Tumoulin, N.Q.)—

Mr. J. A. V. Rudd, of the Veterinary Staff, supplies the following answers:—

(1) *How soon after calving should a cow be washed out?*

If a cow calves normally there is no necessity to interfere with her in any way. As a matter of fact, she would be much better off if she was left alone.

(2) *When castrating a pig recently, after cutting through the first skin, a brownish, jelly-like substance appeared; then, when cutting the string of the testicle, I had to cut it away from a hard pus. What would these symptoms indicate?*

The jelly-like substance was serous exudate, the product of inflammatory action, probably due to the presence of pus near the testicle.

(3) *Some time ago five young cows died, apparently on their feet. There was no swelling. On opening them, I found that the entrails contained a little water. The cows passed much more liquid than solids. Do these symptoms indicate that the cows were poisoned, and, if so, could a bone analysis be made to determine the cause of death?*

The cows apparently died of arsenical poisoning. It is possible to find mineral poisoning if the intestines and their contents were subject to analysis. This is done in this Department by the Analytical Branch in Brisbane.

Wattle for Tanning.

F.A.T. (Nanango)—

The specimen of wattle is *Acacia glaucocarpa*, one of the feather-leafed wattles allied to those of the decurrens group which are the principal ones at present used in tanning. So far as analysis goes, the species you sent has generally given a fairly high tannin content (about 26 per cent). If you want to dispose of the bark, we would advise you to write to the Secretary, Master Tanners' Association, Brisbane.

General Notes.

Staff Changes and Appointments.

The following have been appointed members of the Southern District Stallion Board:—Major A. H. Cory, M.R.C.V.S. (Chairman), Messrs. Ernest Baynes, P. Short, and J. Sprott.

Constables H. H. Eiser and W. E. Lynam, stationed at Sapphire and Duchess respectively, have been appointed Inspectors of Slaughter-houses as from the 2nd August, 1930. The services of Mr. J. C. Pryde, Temporary Inspector of Stock at Coolangatta, have been continued from the 22nd July to the 2nd September, 1930.

The appointment of Mr. L. F. Mandelson as Assistant Pathologist has been confirmed as from the 1st January, 1930.

Acting Sergeant T. J. Peterson, stationed at Oxley, has been appointed an Inspector of Slaughter-houses as from the 26th July, and the Officer in Charge of Police at Yelarbon has been appointed an Acting Inspector of Stock as from the same date.

Mr. J. H. B. Goldie has been appointed Millowners' Representative on the Childers Local Sugar Cane Prices Board, vice Mr. C. R. Fletcher, resigned.

The following transfers of Cane Testers and Assistant Cane Testers have been approved:—

(*a*) *Cane Testers*:
Miss J. Orr, from North Eton Mill to Cattle Creek Mill;
Mr. J. C. D. Casey, from Cattle Creek Mill to North Eton Mill.

(*b*) *Assistant Cane Testers*:
Miss T. Payne, from North Eton Mill to Racecourse Mill;
Miss D. Bowder, from Millaquin Mill to Plane Creek Mill;
Miss R. Rowe, from Plane Creek Mill to Millaquin Mill.

His Excellency the Governor in Council has approved of the following appointments under "*The Banana Industry Protection Act of 1929*":—

Name.	Appointment.	Present Position or Address.
W. J. Ross	Chief Inspector	Senior Instructor in Fruit Culture
H. G. Crofts	Secretary (in acting capacity for six months)	Clerk, Head Office, Department of Agriculture and Stock
S. E. Stephens	Agent (in conjunction with present position)	Instructor in Fruit Culture
C. G. Williams	Agent	Inspector under Diseases in Plants Act
J. A. Stockdale	Agent	Inspector under Diseases in Plants Act
S. A. Green	Agent	Inspector under Diseases in Plants Act
D. McLaurin	Agent	Inspector under Diseases in Plants Act
K. King	Agent	Inspector under Diseases in Plants Act
E. L. V. Filer	Agent	Assistant Fruit Branch, Department Agriculture and Stock
P. Mitchell	Agent	Temporary Inspector Diseases in Plants Act
J. H. Mitchell	Agent	Temporary Inspector Diseases in Plants Act
E. L Miles	Agent	Temporary Inspector Diseases in Plants Act
F. A. Drake	Agent	Experimental Station, Bartle Frere
C. N. Morgan	Agent	Goombungee, *via* Toowoomba
W. G. Hancock	Agent	Wellington Point
A. J. Browne	Agent	Gregory terrace, Brisbane
J. McG. Wills	Agent	Bauer street, Southport
L. L. S. Barr, B.Sc. Ag.	Agent	River terrace, Kangaroo Point

Of these appointments, those of Messrs. P. Mitchell, J. H. Mitchell, E. L. Miles, F. A. Drake, C. N. Morgan, W. G. Hancock, A. J. Browne, J. McG. Wills, and L. L. S. Barr will be on probation for a period of six months. Any of the appointees who already hold the position of Inspector under the Diseases in Plants Act and/or Inspector under the Pest Destroyers Act will continue to hold those positions as subsidiary to their new appointments.

Mr. J. G. Scholefield has been re-appointed Government Representative, and Messrs. J. A. Milson, J. R. Coghlan, N. Marlay, and H. H. Hamilton have been appointed Members on the Boulia Dingo Board.

Messrs. W. R. Burnett, D. Culhane, and T. Douglas, Inspectors of Stock, have been appointed also Inspectors of Brands, and Messrs. D. Culhane, T. Douglas, and H. J. D. McBean, Inspectors of Stock, have been appointed also Inspectors of Slaughter-houses.

Mr. J. R. Canty has been appointed a Temporary Inspector of Slaughter-houses for the period from 21st July to 31st August, 1930.

The following transfers of Inspectors of Slaughter-houses have been approved:— N. Custance, from Townsville to Warwick; N. Flanagan, from Bundaberg to Townsville; H. J. Walker, from Brisbane to Bundaberg; S. C. Smith, from Mareeba to Cairns; H. F. Sibley, from Charters Towers to Mareeba; A. Black, from Oxley to Charters Towers; and G. P. Randles, from Zillmere to Oxley.

Acting Sergeant W. Cook, stationed at Nanango, has been appointed an Inspector of Slaughter-houses. Mr. W. D. Lewis, Temporary Inspector under the Diseases in Plants Act, attached to the Departmental Picking-over Shed, has been appointed an Inspector, on probation, under the Diseases in Plants Act. The headquarters of Mr. J. N. Jones, Temporary Ranger under the Animals and Birds Acts, have been transferred from Mungindi to Miles.

Western Downs Dingo Board—Additional By-laws.

By-law No. 19 of the Western Downs Dingo Board has been approved. This by-law provides that the Board shall only grant one permit for dingo and marsupial destruction for every 5,000 acres of a holding. This by-law will be in force in the Western Downs Dingo District as from the date of Gazettal, that is, 9th August, 1930.

Levy for Banana Board.

An Order in Council under "*The Banana Industry Protection Act of* 1929" has been approved providing for a levy on all banana growers for the maintenance of the Banana Industry Protection Board. The assessment will be levied on growers of bananas at the rate of one penny halfpenny (1½d.) per case containing one and a-half bushels or less, and at the rate of one penny halfpenny (1½d.) per three bunches of cavendish, five bunches of lady's finger, or six bunches of sugar bananas. With respect to bananas marketed in Queensland the levy shall be collected by means of a deduction made by all commission agents, commodity boards, merchants, or other persons from proceeds of sales of bananas, the amount so accruing to be remitted by such commission agent, &c., to the Under Secretary, Department of Agriculture and Stock, Brisbane, not later than the seventh day of each month in respect of all bananas sold or purchased during the preceding month. With respect to bananas marketed elsewhere than in Queensland the method of collection shall be by means of the Committee of Direction of Fruit Marketing or the Commissioner of Railways adding the sum of 2s. 10d. (two shillings and tenpence) per ton to the freight charges on such bananas, such amounts collected to be remitted as above. This assessment will come into operation on the 2nd August, 1930.

Levy for Maintenance of Banana Experimental Stations.

An Order in Council under "*The Primary Produce Experiment Stations Act of* 1927," has been approved providing for a levy on growers of bananas for the maintenance of the Banana Experiment Stations at Kin Kin East and Bartle Frere. The assessment will be levied on growers of bananas at the rate of three farthings (¾d.) per case containing one and a-half bushels of bananas or less, and at the rate of three farthings (¾d.) per three bunches of cavendish, five bunches of lady's finger, or six bunches of sugar bananas. With respect to bananas marketed in Queensland the method of collection shall be by means of a deduction to be made by all commission agents, merchants, commodity boards, or other persons from proceeds of sales of bananas, the amount so accruing to be remitted by such commission agent, &c., to the Under Secretary, Department of Agriculture and Stock, Brisbane, not later than the seventh day of each month in respect of all bananas sold or purchased during the preceding month. With respect to bananas marketed elsewhere than in Queensland the method of collection shall be by means of the Committee of Direction of Fruit Marketing or the Commissioner for Railways adding the sum of one shilling and fivepence (1s. 5d.) per ton to the freight charges on such bananas, remittance to be made as above.

Cheese Board Election.

The result of the voting in connection with the election of five growers' representatives on the Cheese Board was as follows:—

Division No. 1—
Thomas Dare (Narko) .. .. 89 votes
Gilbert Julius White (Maclagan) .. .. 58 votes
David William French (Sunnyvale, Bell) .. .. 28 votes

Division No. 2—
Henry Thomas Anderson (Biddeston, Oakey) .. .. .. 135 votes
William Thomas Harris (Toowoomba) .. .. 46 votes

Division No. 3—
Alfred John Harvey (Pittsworth)—Returned unopposed.

Division No. 4—
David Gabriel O'Shea (Southbrook) .. .. 108 votes
Albert George Tilley (Rosehill) .. .. 60 votes
George Burton (Cambooya) .. .. 34 votes

Division No. 5—
Arthur Pearce (Coalstoun Lakes)—Returned unopposed.

Messrs. Dare, Anderson, Harvey, O'Shea, and Pearce will therefore be appointed for a term of three years as from the 1st August.

Peanut Board Referendum and Election.

The question of the constitution of a Peanut Board to deal with all peanuts grown for sale, instead of from one half an acre and upwards as at present, was submitted to peanut growers and the following is the result:—

For .. .. 346 votes
Against .. .. 62 votes

The election of members to the Board for the respective districts was also carried out at the same time with the following results:—

District No. 1 (Wienholt and Nanango).— Votes.
Frederick Christian Petersen (Kingaroy) 165
Charles Frederick Adermann (Wooroolin) 157
John Wesley Johnston (Wooroolin) 110

District No. 2 (Central Queensland).—
Alfred Skinner Clark (Sandhills) .. .. 57 votes
Reuben Johnson (The Caves) .. .. 39 votes

District No. 3 (Rest of Queensland).—
Albert George Whiting (Atherton) .. .. 46 votes
Albert Charles Perske (Degilbo) .. .. 31 votes

The necessary steps will be taken for the constitution of the new Board as from the 1st September, and the appointment of members thereto from that date.

Messrs. Petersen and Whiting will hold office for a term of two years, and Messrs. Adermann and Clark for one year.

Marketing of Tomatoes.

On the 31st July the Committee of Direction issued a Tomato Direction, to come into operation as from the 15th September to the 15th December, 1930. Petitions have now been received from various districts asking that an Order in Council be issued by the Governor in Council declaring that the tomatoes to which the direction relates shall be acquired by the Committee of Direction as the owners thereof. The tomatoes to which the direction relates will be all tomatoes grown for sale from the 15th September, 1930, to the 15th December, 1930, in the district from Nambour in the north to the New South Wales border in the south, to Rosewood in the west and the Pacific Ocean in the east, including the islands in Moreton Bay. A Regulation (No. 199 under the Fruit Marketing Organisation Acts) has now been issued to govern the poll to decide whether or not the Order in Council giving the Committee of Direction the power to acquire the tomatoes shall be issued.

The Committee of Direction is to conduct the poll, and all voting papers must be returned so as to reach the Committee of Direction not later than the 30th August, 1930, at noon. All persons in the district concerned who are growing tomatoes for sale on a wholesale basis will be eligible to vote, and, to insure their names being on the roll, growers are invited to send their names and addresses at once to the Committee of Direction of Fruit Marketing, Turbot street, Brisbane. The Committee of Direction is compiling the roll of persons eligible to vote from various sources of information, and the name of any person who satisfies the Committee of Direction that he is a "grower concerned" will be inserted on such roll.

Sugar Levies for 1930 Season.

Regulations have been passed under the Primary Producers' Organisation and Marketing Acts providing for levies on growers of cane in Queensland for 1930. There are levies providing for a Defence Fund, and for the administrative purposes of the Queensland Growers' Council, District Canegrowers' Executives, and Mill Suppliers' Committees, &c. Full particulars of these levies will be supplied to-morrow.

Extension of Operations of Cheese Board.

The present Cheese Pool was constituted in 1927 for a period of three years ending on the 31st July, 1930. By an Order in Council dated the 29th May, 1930, the Governor in Council gave notice that it was his intention to extend the duration of the Board for a further three years until the 31st July, 1933, and that he would receive, on or before the 30th June, 1930, a petition for a poll to decide whether or not the Board should be extended as intimated. As no petition was lodged, a poll was unnecessary, and an Order in Council has now been passed extending the operations of the Cheese Board for a period of three years as from the 1st August, 1930—that is, until the 31st July, 1933.

Angora Rabbits.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has received further information through the Queensland Agent-General in Great Britain, which should be of interest to those persons who have taken up the breeding of Angora rabbits in this State.

The information furnished shows a somewhat better demand for first grade wool, and the price for this quality has risen 3s. or 4s. per lb., the current quotation being 28s. per lb.

The following price list is issued by the leading firm of spinners dealing with this commodity:—

Angora Rabbit Wool.

Extra super	28s. per lb.
Firsts	24s. per lb.
Seconds	17s. to 20s. per lb.
Thirds and matts	7s. 6d. to 10s. per lb.

Delivered at mill.

However, it is pointed out that possibly only the production of the very best wool would be profitable to Queenslanders, as consideration must be given to the incidental and other costs involved in export to such a distant market.

Buzacotts—A Successful Year.

Read at the annual meeting of the shareholders of Buzacotts (Queensland) Limited, machinery merchants, Brisbane, the directors' report stated that, notwithstanding the very difficult conditions which prevailed, particularly during the latter part of the year, turnover had been maintained, and the position of the company, both financially and otherwise, had shown an improvement. In the course of the year several new agency lines had been added to the company's already long list. Chief amongst these were the Howard Jnr. Rotary Hoe and Lightning Fruit Graders and Ethylene Gas. The reception of the Howard Jnr. Rotary Hoe by practical men had been most encouraging, and sales had reached a very high figure. The machine was instrumental in considerably lowering production cost, and its success in this respect can easily be gauged from the excellent results obtained by owners.

A large number of Lightning Graders had been sold and progressive growers were very keen on the introduction of Ethylene Gas, particularly for the colouring of mature citrus fruit. It was well known that in some localities the fruit, although actually mature and with the right sugar content, did not colour properly, and Ethylene here was indispensable. Cases were cited of the price of fruit increasing by at least 5s. per case after treatment with Ethylene Gas.

In moving the adoption of the report and balance sheet, the chairman (Mr. E. W. Buzacott) stated that he was confident that the shareholders would be pleased to see that the company had maintained its position and that the rate of dividend was to be the same as last year. He informed the meeting that the removal of the business to the company's own premises in Petrie Bight, next to Atcherley House, had been completed, and that the business had greatly benefited by this move. He stated that it was the unanimous wish of the board that there be placed on record their appreciation of the services rendered to the company by the entire staff under the capable management of Mr. R. D. Huish. The retiring directors, Messrs. E. W. Buzacott (Chairman), R. D. Huish (Managing Director), Alderman A. Watson, Messrs. F. G. Carr and F. W. Hiscox were re-elected on a unanimous vote.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE PREMATURE BABY.

Did you know that during 1929 853 babies under twelve months in age died in Queensland? Of these deaths that took place during the first year more than half occurred during the first month of life. A large number of these children were premature or else were feeble, weakly infants who should have received the same treatment as those who were premature.

If even half of the premature babies who are born each year in Queensland could survive, the much desired result would be a marked lowering of the infantile mortality rate. While most people know that when a baby is premature it needs special care and treatment, many have little knowledge of the special points which require immediate attention if the child is to have a reasonable chance of survival. Such babies when born in a locality where there is a baby clinic should be at once brought under the notice of the clinic nurse, who is always willing to advise the mother or to help her in carrying out the doctor's directions in the care of these cases. For the mother in the country where clinics and welfare nurses are not available the following directions may be useful:—

If a baby is under 5 lb. in weight when born it is better to treat it as premature to get satisfactory results. But even those who weigh so little as only 2 or 3 lb. can often live and develop into strong, healthy children if the necessary care be taken.

In appearance the premature differs from the normal baby in more than size. The little body is very soft and limp, the skin wrinkled, downy, and redder than usual. The infant is very weak and often too feeble to suck. The cry is feeble and suggestive of the mewing of a young kitten. Often the baby cannot cry at all.

There are four points which must receive immediate attention. They are—(*a*) Prevention of chilling (this is most important and must be the first consideration) (*b*) careful feeding with mother's milk; (*c*) careful avoidance of infection; and (*d*) avoidance of unnecessary handling .

Prevention of Chilling.

Because the baby has come too soon into the world it chills very quickly. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. Therefore, when we know that an infant is to be born prematurely, special care should be taken to prevent this chilling. A small cot should be prepared, and by means of hot bottles thoroughly warmed. Baby must not be bathed nor even oiled at first. As soon as it is born wrap it in warmed cotton wool or soft flannel and place it in the warm cot. Six or eight hours later, if the child is then thoroughly warm, oil it with warm olive oil, using cotton wool swabs. Do this as quickly as possible, uncovering only a portion (say one arm or leg) at a time, and also taking care to move or handle the baby as little as you can. Very small babies should be oiled without being lifted from their cots, which should be screened from draughts while it is being done. In hospitals cots are specially prepared for such babies, but special cots are not essential, and a very satisfactory and comfortable bed for the "prem." can be quickly improvised. Half of an old-fashioned "dress basket" does splendidly, and failing this the family clothes basket or a box can be used. To prepare the improvised cot first line it with either brown paper or newspaper; this is to prevent the escape of heat. After this, and for the same reason, line the inside with blanket. A strip of old blanket or a wide woollen scarf can be used. To fix this place it first outside the basket so that it reaches from top edge to bottom, and fasten it securely either with a string tied all the way round or by sewing through the blanket and basket at intervals. Having done this turn the blanket over inside the basket so that

it is completely lined and also has a tidy top edge. Now throw a single blanket over the cot; it should not reach quite to the head of the basket. Place a thin firm pillow in the bottom and a soft one over it to form a mattress. A flannelette napkin will serve as a sheet, and a small folded fine towel as a pillow. At first a mackintosh may not be necessary, but later must be provided. Into this warmed cot baby is placed, wrapped in his cottonwool jacket, and covered with a soft shawl. Place a small light blanket over, letting it lie loosely on the child, and then draw the sides of the enveloping blanket across the cot and tuck them in. But this is not enough. Premature babies chill so easily that more warmth is required, and this is supplied by hot water bags or bottles. Rubber bags are best, but if they are not available stone gingerbeer or ink bottles will serve. In cold weather three are required—one at the foot and one at each side. One bag is placed between the two pillows at the foot of the bed; the others lie, not against baby's body, but tucked down at the side between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. These require to be refilled, one every hour in rotation, in winter. In summer two bags are usually sufficient once baby is thoroughly warm, and they do not need changing so often.

Give baby plenty of fresh air. Keep him in a well-ventilated room. In our Queensland climate the air, even in winter, is not cold enough to hurt the premature baby provided his bed is kept properly warm. Guard against overheating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 degrees Fahr. Gradually decrease the artificial heat as baby's strength improves. Oil him every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb. As he improves commence with sponging, at first only face and hands, and gradually increase until he is being fully sponged, and later bathed.

Feeding is Very Important.

The healthy, normal baby thrives best if fed on his mother's milk. For the premature baby natural feeding is even more necessary; in fact, few survive without it. Though the baby may live and thrive on an artificial food, he is much more likely to do so if he is fed on his mother's milk, and failing this the milk of another healthy mother is the best thing. Sometimes a relative can be found who has a healthy baby of her own, and so is able to act as foster mother. It does not matter if the foster mother's baby is some months old; the milk will not hurt the premature baby on that account, though it may be necessary to dilute it perhaps to half strength at first. If there is any doubt as to the health of the foster mother until a test can be made, or the opinion of a doctor obtained, do not put the child to the breast, but feed from a spoon, and always boil the milk before it is given to the baby. If only a small amount of breast milk is available from either mother or foster mother give that first to the baby, and then make up to the full requirement with the artificial food. It will not do any harm to give the two foods in this way; in fact, the small quantity of mother's milk will help baby to digest the artificial food.

If breast milk is unprocurable, artificial feeding must be tried. Whey, which is easily digested, can be useful at first, and the child graded later to the following whey-milk mixture:—

> Scalded milk, 2 oz. (4 tablespoonfuls);
> Scalded whey, 2 oz. (4 tablespoonfuls);
> Boiled water, 1 oz. (2 tablespoonfuls);
> Sugar of milk, 2½ flat teaspoonfuls not pressed down;

or condensed milk can be tried, and if this is used a strength of one teaspoonful of condensed milk to twenty-four teaspoonfuls of water can be used to begin with. The condensed milk should always be poured from the container to the spoon in measuring. Very gradually, as the child improves, the strength can be increased to one teaspoonful of condensed milk to eight teaspoonfuls of water.

Nothing but boiled water should be given to the premature baby for the first twelve hours, but after that it must have food. It is impossible to say how much the child should have at a feed. Some of these infants are able to suck the breast and obtain all they need with three-hourly feeding. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye-dropper, and if able to take only very little (perhaps only one or two teaspoonfuls) must be fed, at first, perhaps every hour with one interval, at night, of three hours. With a feeble baby it may take as long as half an hour to give it this small quantity. As soon as the baby can take a larger amount gradually increase the interval between the feeds (by a quarter of an hour at a time) to three hours, with one five-hour

interval at night. Also substitute a small feeding-bottle for the eye-dropper as soon as the child shows signs of sucking. While baby is too feeble to suck the breast the mother's milk must be expressed, either by hand or the breast pump, every three hours during the day, so that the supply may be kept up. As the child's strength increases it may be put to the breast, at first for five minutes twice daily, and the feeding finished from the bottle. A rough estimate of the amount of food that a premature baby should take is 3 oz. for each 1 lb. of body weight. Thus, if a baby weighs 3 lb., try to give him 9 oz. of food daily. So if he is fed nine times daily endeavour to give him 1 oz. each time. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in and attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible; have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him. But change of position is necessary; turn him from one side to the other every four hours.

The care of a frail premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

LADY STONEHAVEN'S MESSAGE.

Before leaving Brisbane on her homeward journey, Her Excellency, Lady Stonehaven, issued the following farewell message to the women of Australia:—

"The women of Australia have built up in the past great traditions and upheld noble ideals. They, equally with the men, were the pioneers in this great country. They lit the torch—and it remains with the women of to-day to keep the flame alive. The old noble traditions and ideals must be firmly upheld and maintained. The same spirit with which the women of Australia gave their husbands, brothers, and sons for the war animates the women of Australia to-day—the spirit to endure hardships and sorrows with a brave face, to overcome difficulties with a smile, to give up much, and to help their mankind to face adversities with bravery and perseverance. Patience and courage will be needed even more in the future, for the trials of peace make as great demands as do the stress and tribulation of war.

"I am quite confident that the women of Australia will respond to the call, and will uphold once more the honour of Australia, and win the respect of the world.

"It is an oft-repeated truism that we are facing hard times; but if those hard times are faced with courage and self-denial they will pass, and we shall all be better and happier for having overcome them. Having lived amongst the women of Australia for five years (and five very happy years) I am absolutely confident that their courage, patience, and real effort will carry them through these hard times. May I wish them, their husbands, brothers, and sons, from the bottom of my heart, God's blessing."

FLOWER GARDEN.

The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant tuberose, crinum, ismene, amaryllis, pancratium, hemocallis, hippeastrum, dahlias, &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphis, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

THE ART OF ROSE CULTURE.

By G. H. HEERS (Department of Agriculture and Stock).

In a Lecture at the June Show of the Wynnum and Manly School of Arts Horticultural Society.

THE art of Rosiculture is romantic, full of disappointments and surprises, intermingled with wonderful discoveries which make it so fascinating.

I have great faith in Queensland generally, and, as a rose-growing country, I know of no place so favourably served from the point of climate and natural conditions. You may plant, bud, and flower a rose every day throughout the entire year. In what other country can this be done? In the matter of propagation, we can accomplish in a few months that which is most countries would take years to do. Hundreds of new varieties are raised annually in Great Britain, America, and other parts much less favourably situated, and actually imported to this country every year, instead of which we should be supplying the world's requirements in this direction.

In view of these facts, I propose to deal with the subject in a general way, yet keeping in mind any matter which would tend to instil in every rose enthusiast the desire for further knowledge of the rose, so that he may be encouraged to try his hand at raising new varieties, which after all is very simple.

In addition to the desirability of raising our own new sorts, this aspect of rose culture is undoubtedly the most fascinating of all its phases. Nature has provided the conditions, and all that is wanted is the will and the way. In order that you may more readily grasp the position, I propose to traverse very briefly the origin of the rose. This may not be popular with some of my listeners, but to build on a proper foundation it is necessary to show what things have already been achieved and how easy it will be to follow up this important work. It must be remembered that various species that will be briefly touched on cannot be compared with our present-day creations. Indeed, even at the present rate, it is difficult to foresee what standard of perfection will eventually be reached.

The Queen of Flowers.

The origin of the rose is somewhat conflicting. It is on record that even as far back as 600 B.C. Sappho sang—

"Would Jove appoint some flower to reign
In matchless beauty on the plain,
The Rose, mankind will all agree,
The Rose, The Queen of Flowers should be."

That position has never once been seriously disputed, and the rose still stands secure. From Homer to Tennyson and so on to-day, every poet, songster, and artist has always seized upon the rose in the embellishment of his art.

There are many species of wild roses, mostly originating in Asia, South and Central Europe, and North America. Although these are practically unknown in Queensland, in America sixty-eight species of wild roses are still catalogued. With these were produced the early Hybrids, Austrian Briar, Bengall, Rugosa, Sweetbriar, Damask, Cabbage, Multiflora, &c. One thing is certain—to-day's great ever-bloomers owe their existence to these wild flowers, plus, of course, man's handiwork.

English history shows that in the 14th century she had the "Wars of the Roses," when the combatants each chose a rose for their emblem, proving conclusively its popularity even in those days.

Some History.

In 1596, Austrian Copper, a highly coloured variety, was originated. Though this had always been admired for its colour and perfume, it was left for that noted French rosarian and hybridist, Pernet Ducher, to exploit this rose with a view to transmitting some of its richness and perfume into our modern roses. The result has been the creation of that wonderful strain of beautifully coloured roses known as "Pernetianas," so popular in most parts of the world, though unfortunately few of them thrive in this portion of Queensland. In 1778, a Cabbage rose (*Rosa Centifolia*) "Unique Blanche" was raised by Grimwood. Though there are early records of the Tea rose in India, Persia, and China, the date of its arrival in England is not clear, but it receives mention in 1810 and Hybrid Perpetuals in 1812. With these the work of hybridisation commenced in England, crossing and recrossing them with Hybrid China, Damask, Provence, and Bourbons. The Damask with its rich scent having been brought from the Orient by the Crusaders, its peculiar

fragrance is to-day still intact in such roses as Geo. Dickson, General McArthur, &c. The first record of the Hybrid Tea Class, a cross between the T. and H.P., so far as I am able to find, was when that quite good rose, ''Adam,'' was originated in 1838. This rose, I might say, is still to be found growing well in the Brisbane Botanic Gardens, and also in Wynnum. Other notable early productions were Prince Camille de Rohan, H.P. in 1861, and La France, H.T. in 1867, both being still with us to-day. I forgot to mention that in 1820 Champney created the Noisette type by crossing T.'s with the China Musk. In 1878 what is known as Crimson Rambler was raised in Japan, its original name being ''Shi Tz Mu'' (meaning Seven Sisters). This rose was brought to England in 1890, and it is said that the great rosarian of the day, Charles Turner, made a fortune by disseminating it under the name of ''Crimson Rambler,'' so that you will see that America is not the only country where that kind of thing has been done. Of course, the American never does things by halves. For instance, that well-known and very common rose, W. R. Smith, has now been sent out in that country under six different names, each description being an exaggeration on the previous one. Even some of our own people who should know better seem to think it sounds better to call F. K. Druschki, Snow Queen, and so on. No rosarian of any note would dream of such a thing, because he understands the circumstances under which they were named, and no individual is entitled to undermine such associations. Especially is this distasteful when after years of work, the raiser, no matter what his nationality, has bestowed an honour on someone near and dear to him. If you object to the name, be consistent and refuse to grow the rose.

The Work of the Plant Breeder.

Although the English hybridist has accomplished wonders, it is said that he has never set about breeding with any definite object, just crossing and recrossing any old way. The result has been that may English roses lack growth. However, it must not be overlooked that though these roses may not suit us in Australia, they may be quite good under pot culture. There are quite a number of hybridists in various parts of the world who have been breeding along defined lines, Pernet Ducher, Dr. Van Fleet, Peter Lambert, M. H. Walsh, and our own Alister Clark, of Glenara, Victoria, at whose wonderful home I had the pleasure of spending last Anzac Day, and oh, what a day! Mr. Clark is a gentleman who grows roses not for profit but for the love of them. He has growing many hundreds of distinct seedlings of his own raising, which when tested are usually sold for the benefit of some Horticultural or Rose Society. Mr. Clark has a firm conviction that by working crosses with ''Gigantea,'' he hopes ultimately to produce a rose which will be proof against mildew. I was shown a gigantic plant of this species twenty-seven years old, stem 25 inches thick, and branches 36 feet long. Two or Mr. Clark's roses which are popular and doing well in Queensland are Sunny South and Blackboy. I believe that I have persuaded Mr. Clark to give us in future an opportunity of testing some of his fuller types of roses which fail to open in Victoria but which may prove suitable for our conditions. I believe Mr. Clark to be thoroughly Australian, and should the opportunity arise, I am sure Queensland will also benefit by his generosity. The other plant breeders mentioned have also made definite progress along given channels, each working on different types.

Climbers.

Altogether it is estimated that there are 12,500 varieties represented by the following types:—H.P., H.T., T., Bourbon, Polyantha, Wichuraiana, Banksia, Noisette, and the numerous climbing sports. In regard to these climbing sports, I would like to point out one aspect which is not well understood. After purchasing a climber it sometimes fails to climb and the nurseryman concerned is immediately assailed as having taken one down. Now this is often quite a wrong attitude, as no reliable propagator would think of working from anything but true climbing wood; and, further, would not send it out as a climber if it had not by then shown climbing form in the nursery. The trouble is few people understand that the original stem sent out by the nurseryman never becomes part of the future plant. This portion always dies and new growth coming from the impregnated portion near the base, which by the way may revert to the original dwarf, commences to bloom and forms the foundation of the tree to be. In proof of this theory, I ask you to look at any rose planted in your garden last year, when you will discover that that portion with the nurseryman's label attached is quite useless and should have long since been removed. For this reason, I favour a plant with only a single stem. In fact, if people only knew, the better plant is the one where the bud is still dormant, as then there is nothing to cut away, the process of which frequently causes disfigurement and even abnormal growths to form on the stem. The briar having been impregnated with the true climbing strain in the process of budding, it is possible by removing every portion of the dwarf growth to sometimes force it to produce the climbing

wood, though years may have elapsed since it was originally worked. Moving the plant to another location, sometimes automatically results in the change taking place.

The Rose in the Garden.

I am one of those who believe that the rose responds to man's sympathy. In fact, it has many peculiarities often found in the makeup of woman—always refined, attractive, and beautiful, appreciates attention and even admiration, in return for which it will give of its best. The rose is also mighty jealous and to a degree selfish. It resents the company of other flowers, wants your undivided attention and certainly excels wherever these conditions prevail. I always recommend that roses should be planted in a bed by themselves, this to occupy the premier position in the garden.

While roses will give good results under almost any condition, soils and their preparation and the natural situation mean much to their real success. I recommend trenching as a general rule, always being careful that the lowest portion of your bed will not act like a dam and hold water. On flat or ground that does not lend itself to trenching, it is better to raise the bed. In such event the earth should be enclosed with a wooden or concrete border. Roses should not be planted near the edges of raised beds, owing to the tendency of drying out.

The Troubles of the Novice.

Many thousands of roses are lost annually through misplaced kindness. I particularly refer to the general tendency of placing artificial fertilisers and fresh manures in the holes at the time of planting young roses. You would never think of giving a newly babe a beef steak. When thoroughly established the rose is a greedy feeder and will take almost any quantity of fertiliser or manure if properly rationed. I once heard a very eminent authority say that there were three things which you could not overfeed—the hog, the rose, and a man.

Colour and Scent.

It is estimated that there have been determined as many as 365 colour variations in roses. Perfumes also are surprisingly numerous and quaint. In 1886 the Horticultural Press of Philadelphia set out to identify perfumes, and in that year decided on Peach, Melon, Violets, Pinks, Raspberry, Hyacinth, and Apricot. Mr. H. R. Darlington and Rev. J. H. Pemberton, two noted English authorities, later added Russian Leather, Pear, Hay, Alcohol, Apple, Prune, Wine, Musk, Damask, Tea, and Fruit, and I think with the advent of the new white rose "Caledonia" out this year, I recognise yet another scent, that of Honey. Tea scent is mostly associated with lighter shades, Lady Hillingdon being an example, Damask in Geo. Dickson, General McArthur, and Radiance, whilst that of Fruit is very strongly found in Rev. F. Page Roberts.

Terms of form are expressed as Globular (Geo. Dickson), Flat (Malmaison), High centred (K. A. Viktoria and Mrs. Geo. Shawyer), Cup (Caroline Testout and Star of Queensland), Reflexed (J. J. L. Mock), also Imbricated, Ovoid, Cabbage, &c.

Types of Plants.

There is some confusion about types of plants, particularly regarding standards. True standards are seldom seen in Queensland, and I shall have more to say about this directly. (With the aid of specimen plants and a blackboard, Mr. Heers here explained the difference between a Standard which is worked some 3 feet or so from the ground on a briar stem, whilst Bush roses were those which were generally called dwarfs and which were worked—i.e., budded, on short stems, say, 4 to 5 inches from the root system, which when correctly planted would be level or just below the surface of the ground. Mr. Heers here showed a plant purchased at a department store which was budded on a stem about 10 inches long, and described it as useless, as there was no way in which such a plant could be correctly planted.)

Reverting again to the question of standards, it is the general belief that the sun is too hot in Brisbane for this class of rose. It is thought that the heat deleteriously affects the long exposed stem or trunk of the bush. If this were so, how is it that standards do particularly well in the central western portion of Queensland, where the sun is much hotter than in Brisbane It would appear that there are other reasons and, personally, I have seen excellent specimens here of strong growing types on "Rosa Odorata" and the weaker kinds quite good on "Fortunii." It is well known that standards from the South are worked on South Australian Dog Rose "Rosa Canina." This has a very shallow rooting system, which may have something to do with its unsuitability for Queensland. I am, therefore, of the opinion that a good deal has to do with the understock.

Whilst on the question of Understock, I might say that so far I favour "Rosa Odorata" for general use in Queensland. The same thing is used in the Southern States but is known under different names. In New South Wales it is called "American Noisette," Victoria "Maiden's Blush," South Australia "Boursault," and in Queensland it is also known as "Manetti." It was reported that at a lecture recently given at the Albert Hill, Brisbane, I favoured "Rosa Multiflora" as an understock. What I actually said was that in New South Wales this briar was becoming more and more popular and that some nurserymen were changing over to it entirely. I mentioned that it was undoubtedly an advantage to work Pernetianas on "Multiflora" and that in view of the fact that this blood was predominant in most of our newer roses, the time may come when we might have to seriously consider the advisability of also making the change. (Here Mr. Heers showed a number of understock in their various stages of preparation and growth from the naked cutting on to the young plant ready for planting out. With the aid of specimens the good and bad points were demonstrated, the speaker maintaining that the proper preparation of the cutting was important and unless the "heel" was so prepared to force an even callus, the rooting would not be symmetrical, upon which greatly depended the very foundation of a good plant.)

Failures Should be Negligible.

Provided that you have been supplied with the right class of plant and plant as directed at the right time, failures should be negligible, as the rose is hardy and easy to transplant. Failures can generally be attributed to one or more of the following causes:—Having used fresh manures or fertilisers at the time of planting, allowing roots to be exposed to the sun or wind, excessive wet weather, sodden ground, planting near shrubs, trees, hedges, and in shady positions, westerlies, heavy frosts, planting too shallow or too deep, or when placing the plant in the same position where a rose formerly grew without first replacing the entire soil, plants being knocked by children, dogs, or the careless gardener. The most common fault, however, is early planting. I have in and out of season preached the advantages of late-planting for Queensland, and can now definitely say that as a result quite a large number of growers who have followed my advice inform me that they have obtained wonderful results. It is inconceivable that in our climate, where roses are in full bloom and full of succulent growth as they are during the March, April, May, and early June period, the plant is in a fit state to lift. Then owing to the short intervals of warm weather during winter, which are certain in Queensland, the plants are encouraged to make premature growth which is cut down when frosty or westerly weather appears, as it assuredly does during our mid and late winter months. Remember if these same plants were left in the nursery undisturbed, they would not attempt to put forth growth, and in consequence if left till the winter is just about finished, the plants when transplanted simply jump away and never look back. I have thoroughly tested for the best time to plant, and as a result strongly recommend from August till the middle of September, and have no hesitation in stating that May and June, along with November, December, and January, are the very worst months of the year for planting roses in this country. I have always said that early planting may be quite alright in the Southern States, but very recently it was confided to me by leading authorities in both Victoria and New South Wales that the heavy losses occurring in those States in recent years are probably due to early planting. I am in possession of facts where already this year several lots of one dozen and more have completely gone west, due entirely to this stupid fad of early planting.

Pruning.

I take up the same attitude regarding pruning. August is in my opinion the best time to prune. Pruning is a difficult thing to give oral advice upon. If the blooms are always taken with long stems and any dead and spindled wood removed from day to day, the general overhaul is made comparatively easy. (By the use of the blackboard, Mr. Heers demonstrated some of the most important points. For instance, text-books always advised that the top eye should be pointing outward. This, he said, was quite correct for all tall and upright growers, but was all wrong when the spreading varieties such as Medea were being dealt with.)

Propagation.

In the propagation of roses there are two methods employed, that of cuttings and by budding. The latter, which is more generally used by nurserymen, was here explained in detail. Some varieties do quite well from cuttings, particulary on sandy soils but generally the briar lends vigour to the plant.

How New Varieties are Obtained.

There are two channels from which we get our new varieties. Sporting is one. By this I mean that for some unknown reason any rose may suddenly produce a rose quite distinct from its original. By working the stem which produces this freak, a new and distinct rose may be obtained. I am sure many hundreds of these sports go begging every year for the want of observance and knowledge. This strange phenomenon may be accounted for by the fact that these new types and/or colours may have been lying dormant for many years. This variation is undoubtedly due to the fact that these peculiarities were at some time associated with the parents' predecessors. Such things were also common regarding the human race. (Mr. Heers here, by the aid of prepared diagrams, described the process of cross hybridisation, taking for example several well-known roses, explaining that on the breeding alone F. K. Druschki may some day be expected to throw a pink sport.)

The second and more scientific method was the raising of varieties from seed. Nature has provided that the rose like all other forms of life must reproduce itself and spread over the earth. It bears small fruit containing seed. These the birds distribute far and wide. The rose itself is hermaphrodite, and is therefore subject to self-pollination. There are two methods of pollination, the first being where the pollen from the stamens (male) falls of its own accord upon its stigmas, and, secondly, cross-pollination where the pollen must be transferred from one distinct flower to another. To bring this about there must be some agent. The inanimate, wind and water, and the animate, birds, insects, &c. Here again for the latter, nature provides the necessary inducements in the rose by the production of sweet foods, scents, waxes, &c., in order that the bee or the bird may get some reward for the work performed. Any new sorts created in this way would be purely the result of chance. Having reached this stage and with the lessons that nature has provided, man is enabled to apply his knowledge in a more direct and scientific manner. As a result of his handiwork, enormous strides have been made in perfecting this most beautiful of all flowers. After describing what should be the aim of the hybridist when setting out on this work, including the care necessary in selecting the parents, Mr. Heers again effectively used black and white sketches to more clearly demonstrate the salient points. These included when and how to remove the petals from the "mother" bloom, then the stamens, pointing out that as this work had to be done prematurely so as to avoid interference, it is necessary to protect the stigma for about three days, when the pollen from the male parent should be carefully transmitted by the aid of a camel hair brush. Again, the pod should be covered with some light material like cheese cloth for at least ten days, when the cross will have taken. Make a record of the cross, and wait for the pod to ripen, when the seeds should be removed from the pod and planted. In the better growing months, those will grow very quickly. In the meantime have a few briars growing, and as soon as an eye shows on the seedling transfer this to the briar and with luck you may see the result of your labour within a month or six weeks, thanks to our wonderful natural conditions. As I said earlier, there will be many disappointments, but these are nothing compared with the reward which must sooner or later come the way of the experimentalist.

KITCHEN GARDEN.

Our notes for October will not vary much from those for September. Sowing may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomatoes planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. See our instructions in "Market Gardening," obtainable on application to the Under Secretary, Department of Agriculture and Stock. Rosella seeds may be sown this months. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

Orchard Notes for October.

THE COASTAL DISTRICTS.

October is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy

every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good wtth even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1930.		October, 1930.		MOONRISE. Sept., 1930.	MOONRISE. Oct. 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.10	5.34	5.36	5.48	a.m. 11 29	p.m. 12.1
2	6.9	5.34	5.35	5.48	p.m. 12.21	12.58
3	6.8	5.35	5.34	5.49	1.14	1.52
4	6.7	5.35	5.33	5.50	2.8	2.45
5	6.6	5.36	5.32	5.50	3.5	3.39
6	6.5	5.36	5.31	5.51	4.0	4.33
7	6.4	5.37	5.29	5.51	4.53	5.25
8	6.3	5.37	5.28	5.52	5.47	6.21
9	6.2	5.38	5.27	5.52	6.39	7.18
10	6.0	5.38	5.26	5.53	7.31	8.16
11	5.59	5.39	5.25	5.53	8.25	9.17
12	5.58	5.39	5.24	5.54	9.21	10.19
13	5.56	5.40	5.23	5.54	10.22	11.19
14	5.55	5.40	5.22	5.55	11.23	...
15	5.54	5.41	5.21	5.55	...	a.m. 12.20
16	5.53	5.41	5.20	5.56	a.m. 12.25	1.15
17	5.52	5.42	5.19	5.56	1.27	2.7
18	5.51	5.42	5.18	5.57	2.28	2.49
19	5.50	5.43	5.17	5.58	3.24	3.26
20	5.48	5.43	5.16	5.58	4.12	4.0
21	5.47	5.43	5.15	5.59	4.53	4.35
22	5.46	5.43	5.14	5.59	5.30	5.9
23	5.45	5.44	5.13	6.0	6.9	5.46
24	5.44	5.44	5.12	6.1	6.40	6.25
25	5.43	5.45	5.12	6.1	7.14	7.10
26	5.42	5.45	5.11	6.2	7.53	8.2
27	5.40	5.46	5.10	6.3	8.34	8.56
28	5.39	5.46	5.9	6.3	9.21	9.52
29	5.38	5.47	5.8	6.4	10.16	10.46
30	5.37	5.47	5.7	6.5	11.7	11.44
31	...	...	5.6	6.6	...	12.40

Phases of the Moon, Occultations, &c.

8 Sept.	○	Full Moon	12 47 p.m.
16 „	☽	Last Quarter	7 12 a.m.
22 „	●	New Moon	9 41 p.m.
30 „	☾	First Quarter	12 57 a.m.

Apogee, 6th September, at 7.54 a.m.
Perigee, 21st September, at 2.54 p.m.

It will be interesting to notice the apparent nearness of the planets Mars and Jupiter to one another between 2 and 5 a.m. near the end of the month. Mars will pass from west to east of Jupiter on the 27th. They will appear to be in the constellation Gemini, about 10 degrees southward of Castor and Pollux. The position of the newly discovered 9th Planet is now charted as very near this position of Mars and Jupiter.

Mercury will set at 7.33 p.m. on 1st September; on the 15th it will set at 6.40 p.m.

Venus will set at 9.11 p.m. on the 1st and at 9.16 p.m. on the 15th.

Mars will rise at 2.15 a.m. on the 1st and at 1.57 a.m. on the 15th.

Jupiter will rise at 3.0 a.m. on the 1st and at 2.14 a.m. on the 15th.

Saturn will rise at 12.43 a.m. and set at 2.27 a.m. on the 1st; on the 15th it will rise at 11.45 a.m. and set at 1.32 a.m.

The Southern Cross will reach the western side of the circle in the sky, which it describes daily, about 8 p.m. at the beginning of the month, and about 6 p.m. at the end. It will be noticeably far away to the right (60 degrees) of the position it occupied 6 months ago. The same distance (60 degrees) lies between its position when erect and that when reversed and below the southern horizon in Queensland.

8 Oct.	○	Full Moon	4 56 a.m.
15 „	☽	Last Quarter	3 12 p.m.
22 „	●	New Moon	7 48 a.m.
29 „	☾	First Quarter	7 22 p.m.

Apogee, 3rd October, at 6.54 p.m.
Perigee, 19th October, at 5.42 p.m.
Apogee, 31st October, at 12.18 p.m.

The Moon will be partially eclipsed between 4.46 a.m. and 5.27 a.m. on 8th October. It will also cause an eclipse of the Sun on the 22nd between 6.18 a.m. and 7.40 a.m. At 7 o'clock the Moon will cover one-quarter of the Sun's disc.

Mercury will be at its greatest elongation, 18 degrees west, on 7th October.

Remarkably few of the usual phenomena will be visible in Queensland during this month, such as conjunction of planets with the Moon.

On the 15th Jupiter will be passed by the Moon at 11 a.m., and Mars 14 hours later.

Neptune will be passed on the 18th at 3 p.m.; Mercury also in daylight on the 21st at noon. Venus will be passed on the 25th at 1 a.m. when below the horizon, and Saturn on the 27th at 11 a.m.

Mercury will rise at 4.39 a.m. on the 1st, and at 4.45 a.m. on the 15th.

Venus will set at 8.20 p.m. on the 1st, and at 8.11 p.m. on the 15th.

Mars will rise at 1.33 a.m. on the 1st and at 1.8 a.m. on the 15th.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

ANOTHER instalment of his story of the Queensland sugar industry is contributed by Mr. Easterby, in which he brings his narrative up to 1921 and gives an account of the inquiry, instituted in the following year, into suitable sites for future mills. The third part of Mr. Currie's paper on the Brown Cutworm is another valuable contribution. Mr. Carew has the first article of a series on farmers' sheep and wool, planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating further interest in sheep raising on comparatively small holdings. Tobacco growing in North Queensland, is the subject of an important announcement by the Minister for Agriculture and Stock, Mr. Harry F. Walker; and this is supported by notes on how to establish tobacco seed beds by Mr. Pollock, who also has a timely article on bright tobacco cultivation in the North, in which he gives some particulars of producing districts and of tests made on leaf grown since 1928. Mr. Munro has compiled a useful summary of breeding and feeding points relating to Angora rabbit keeping, as well as of the regulations prescribed for its proper control. Mr. Edmund Jarvis has his customary seasonal hints on entomology for canegrowers, and other sugar pages are well supplied. An excellent camera record of dairy cattle prize winners at the recent Brisbane Royal Show is also presented. General working notes cover a wide field in which farmers will find a fund of useful information.

The Price of a White Australia.

A RECENT "Times" message from Melbourne on the political activity of opponents of the renewal of the sugar agreement has aroused considerable interest in oversea sugar circles. It is recognised there that the embargo is a measure of protection which those in the northern half of Australia realise to be

a necessity, and therefore inevitable. It is also known that the embargo is the source of perpetual grumbling on the part of the much larger population inhabiting the southern half, hence their political activity as the time for renewal of the agreement approaches. The "Times" cable stated the opponents are claiming that the prohibition of foreign sugar costs the taxpayers five and a-half millions a year, and even the highly protectionist paper, "The Age," protests against this "outrage of legalised banditry as an act of definite hostility to the people," and asks only for a protective duty against imported sugar produced by cheap labour. This strong language is some indication of the bitter feeling that is being worked up in the South against the price that has to be paid for sugar produced in one corner of the continent. As has been pointed out so frequently, Queensland is not the only State that benefits materially from the sugar industry. Every State has its refinery, and every State otherwise shares in its wages, profits, and national benefits.

Commenting on the "Times" telegram, the "International Sugar Journal," a recognised authority on the cultural and technical sides of the industry, has this to say on the Southern agitation:—

> But it may be said with justice that these Australians cannot have their cake and eat it. Several decades ago, for good or ill, they decided to banish the coloured or kanaka labour from their canefields, this being part of their deliberate policy of keeping Australia "white." They ignored the fact that practically everywhere else in the tropics and semi-tropics the main labour of the canefields is coloured, and receives the pay of coloured labour. Queensland was purged of its cheap labour; white labour at trade union rates of pay (always high in Australia) steadily took its place and carried out the job of sugar production—at a price. But the world price of sugar is necessarily lower and has been markedly so the last few years, and but for the embargo on foreign sugar Australia would have proved a convenient dumping ground for the world's excess of sugar, as a consequence of which the Queensland sugar industry would have found its product unsaleable. Nor would things be better if there was, as suggested, merely a duty against sugar produced by cheap labour, for who nowadays is to decide whether sugar comes in that class or not, when the ruling world's price is lower than one at which most producers employing cheap labour can be said to make a profit at all. It seems clear to most onlookers that so long as Australia wishes to produce her own sugar and do so with white labour the price must be paid This price is paid, *inter alia*, in consummation of a national policy of keeping the Northern Queensland littoral populated with whites, as a racial barrier against the oriental peoples living to the north of Australia. It is doubtful whether there is any other industry alternative to sugar that would suit the Queensland climate. Sugar, then, is so bound up with State policy that it is hard to conceive the Commonwealth Government making any radical change in the system at present in force. Unfortunately, there have not been wanting indications of late years that Commonwealth policy is apt to clash with the interests of individual States, and *vice versâ*. The larger part of the Australian population lives so remote from the Queensland canefields that it is conceivable that they may, through their State Legislatures, force the Commonwealth Government to modify the assistance granted to the sugar-producers. Time will show how far the opposition has gained force since the last agreement was signed. Those who see a future for Empire sugar in supplying the needs of the United Kingdom will regret it if, on the possible eve of the venture, the Australian sugar industry is launched on a sea of troubles owing to dissention within its borders.

Tobacco Growing in the North.

THE attractive scheme adopted by the Government to stimulate tobacco production in North Queensland by opening for early selection an area of Crown land in the Mareeba district, comprising twenty-five portions specially selected for tobacco production, with due regard to quality of soil, water supply, and ease of access, under certain conditions, cannot but be regarded as the praiseworthy result of careful and lengthy consideration on the part of those responsible. The production of a crop of 5 acres on each of the twenty-five farms, which will mean 125 acres under tobacco this coming season, with a probable yield of 30 tons of cured leaf, carrying a value of approximately £9,000, will be a comparatively small set off against the total quantity at present brought annually into this country, and may be regarded as the beginning of a rapid decline in imports and consequent obviation of the necessity of our continuing to send so much of Australia's gold overseas in payment for them. The profitable return, which may reasonably be expected to

follow the investment made by the successful growers, will no doubt stimulate a rapid settlement of land suitable for tobacco cultivation, which exists in considerable areas in the North. The use of local available labour in grubbing and clearing to allow of 5 acres being cropped on each farm this coming season is also commendable. The cost, not exceeding £12, for grubbing, clearing, and ploughing each acre, must be regarded as a moderate charge in the class of country which it is proposed to bring into production, and one that will meet with the approval of the selector. Reproductive work of this nature, particularly at a time like the present, is most desirable, not only in respect of its promotion of settlement, but also in its relation to the general wealth and progress of the State.

The Passing of Ernest Baynes.

THE primary industries of Queensland sustained another great loss by the death of Mr. Ernest Baynes, President of the Royal National Association, on 22nd September. His passing is deeply deplored by all associated with country life and work, as well as by citizens generally. At every Brisbane show for nearly forty years he was a notable figure, and the Royal National Association, of which he was an active member for thirty-eight years, owes much to his strong and unfailing advocacy of everything that made for the advancement of rural enterprise in this State. To him always nothing short of the best possible was good enough, and he certainly gave of the best of his own great ability to Queensland. In later years, having retired from a successful commercial career, he devoted his time to the Royal National Association as an active and enthusiastic promoter of its interests and as a shrewd director of its great influence in developing the resources of the State. He watched the association grow from its infancy to its present full stature as a sturdy figure and beneficial force in our national life. The high regard of his co-workers as their president was due to his long service to the association. For many years he was ringmaster at every Brisbane show, and relinquished that post to become chairman in 1920. In 1923 he was appointed acting president, and on the death of Mr. C. E. McDougall in 1924 he became president, a position he had occupied ever since. He was a great judge of live stock, especially horses, and was a member of the Stallion Board of Queensland.

The late Mr. Baynes was born in South Brisbane in 1864, and spent his childhood there. His early education was entrusted to the late Major A. J. Boyd, F.R.G.S., who later occupied the editorial chair of this journal for twenty-four years, and his secondary training was received in Horton College, Tasmania, and in the Grammar school, Toowoomba. On leaving school Mr. Baynes worked in various capacities on Queensland stations, and spent some years droving in the far West and in the North. Later he went to Western Australia to assist the Durack pioneers in establishing their cattle station in the Kimberley district. Subsequently he was one of a party sent out by Sir Thomas McIlwraith to investigate the possibilities of sugar-growing in the Western State. On his return to Queensland he joined his brothers in the business of the Graziers' Butchering and Meat Export Company, subsequently known as Baynes Brothers, who held properties on the Burnett and on the Darling Downs. Not only in Queensland but in the Southern States Mr. Baynes enjoyed a deservedly high reputation as a judge of live stock. As a judge of horses his services were always in request. He represented the association on many occasions at all the big shows in Australia, and has adjudicated at Melbourne, Sydney, and Adelaide. He owned many famous ring champions, including Comet, a champion buggy horse of Australia, and Spondulix, the great high jumper. For many years he served as honorary judge of the Queensland Turf Club, and was a member of that body for some time, and was a very popular and prominent participator for many seasons. He was also one of the founders of the Queensland Ambulance Transport Brigade. It was, however, as president of the Brisbane show that he was best known, and the "Brisbane Courier" in the course of a graceful and fitting tribute remarked:—"For that position the late Mr. Baynes was splendidly fitted, because he had an unusually wide knowledge of the primary and secondary industries of Queensland; he was a lover of good stock; he had a very sincere sympathy with the producer; and he was gifted with an engaging manner that helped to smooth away difficulties. In a masterful way Mr. Baynes performed a really great service for the Royal National Association, and incidentally for the State. He was essentially a worker, always anxious to help his association and his country, and he realised very fully the great importance to Queensland of the primary industries. His loss to Queensland will be considerable; to the Royal National Association it will be very great, because it will not be an easy matter to combine in one man the wide knowledge, the keen enthusiasm, and the genial manner of the late Mr. Ernest Baynes."

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART X.

(b) Review of the Industry since Federation

(*Continued*).

THE last section of this history finished with the year 1921. In the following year the Government of the day decided to appoint a Royal Commission to inquire into the most suitable locations for sugar-mills which might be erected in the near future. This Commission, consisting of Mr. W. Harris, P.M., Chairman, and Messrs. Easterby and Salisbury, as members, commenced its investigations in October of that year. The localities in respect to which representations had been made to the Treasury as being probable or possible locations for the erection of new sugar-mills were as under:—

1. Cooktown.
2. Bailey Creek and Daintree River.
3. Atherton Tableland.
4. Liverpool Creek and Maria Creek.
5. Tully River and Banyan.
6. Ingham (Long Pocket and other lands).
7. Lower Burdekin district (Inkerman lands).
8. Bowen.
9. Mackay (Silent Grove, St. Helens, &c.).
10. Rockhampton district.
11. Goodnight Scrub (Bundaberg district).
12. Gayndah (Binjour Plateau and Reid's Creek).
13. Gympie (Goomboorian).
14. Yandina.
15. Buderim.
16. Miscellaneous (Peter Botte, Bloomfield, Lockhart, and Gilbert River).

This was a pretty formidable list, larger even than that which the two previous Commissions had to deal with.

Between 10th October and 13th December the Commission visited all the localities suggested, except those in No. 16.

Their report was made on the 30th December, 1922, and states that after carefully considering the evidence available with respect to each locality reported on, it was affirmed unhesitatingly that the most suitable location for a sugar-mill to be erected in the near future was undoubtedly in the Tully-Banyan area. In that locality the Commission considered there was room for a mill of a capacity at least equalling the South Johnstone Mill.

Two other sites were selected provisionally, viz.:—

(*a*) Bailey Creek and Daintree, conditionally on its being ascertained by a sufficient survey that satisfactory tramway connection at a reasonable cost could be made from Bailey Creek with the Daintree River lands beyond Thornton Range.

(*b*) Inkerman (Home Hill), if it is found that the increase in the production of cane in the Inkerman irrgation area and other lands in the vicinity became so great as to be beyond the crushing capacity available, and that crops other than sugar-cane could not be successfully raised.

A thorough and exhaustive inspection was made of the Tully lands; scrubs were traversed and mill and wharf sites inspected, while a great deal of evidence was taken in connection with these and other matters affecting the project. The mill site then selected by the Commission (Smyth's) was the one ultimately chosen for the erection of the Tully Mill.

As the outcome of the Commission's report the Government decided to at once proceed with the erection of the Tully Mill.

As this was the last Commission up to the present to sit on the subject of Central Mills, it may be of interest to refer to sites that were not visited, and of which little is yet known. At the present time there is small chance of these lands being required in the near future for sugar cultivation; but in the course of time, when the present lands can no longer provide for Australian consumption, attention will be drawn to the possibility of opening up new areas.

Good country was mentioned to the Commission as existing near Mount Peter Botte, which is situate between Port Douglas and Cooktown. These lands lie approximately between Peter Botte and the China Camp Diggings, and are surrounded by ranges 2,200 feet high, which have to be crossed to provide access. The area of cane land is estimated approximately at 20,000 acres, and is compact and fairly level; the soil is of good quality, alluvial, and covered with tropical jungle. The general trend of the country is along Roaring Meg River.

The Bloomfield lands were also spoken of, but these are of limited area, as far as good cane areas are concerned. Some of them were cultivated many years ago, but were abandoned. This district also suffers from difficulty of access.

The Lockhart country on the eastern side of the Peninsula was also brought under notice, but no information could be obtained as to this area.

The Gilbert River lands in the west of the Peninsula were stated to be suitable for canegrowing with irrigation, and it was considered that these lands possessed better soil than the Lower Burdekin district.

The small rainfall in these two lastmentioned localities, and the difficulty of access to market, may militate against their success as canegrowing districts, although the former disadvantage might perhaps be overcome by irrigation. It will be many years, however, before it will become necessary to search for new cane areas, and there may be other localities that would be suitable as well.

Continuing with the year 1922: This season opened up splendidly, and the sugar yield was the best since 1917—viz., 287,785 tons of 94 net titre sugar; but for a falling off in rainfall during the latter part of the year it would have been much higher.

The 1922 season was the last one covered by the Agreement between the Commonwealth and State Governments, which was made in 1920 for three years, providing for the payment of £30 6s. 8d. per ton for raw sugar. This Agreement was not renewed, and a protective duty of £11 6s. 8d. was asked for, but not granted. A duty of £9 6s. 8d. was fixed, which was felt to be disappointing.

The Commonwealth Government, however, was anxious to decontrol those industries (including sugar) which they had been handling in the

war period, and although the industry put up a strong fight for the £30 6s. 8d. Agreement the Commonwealth finally decided that they would grant an embargo against the entry of black-grown sugar into Australia up till 30th June, 1925, the industry to form a pool free from Commonwealth control to buy raw sugar for the 1923 season at £27 per ton of 94 net titre sugar f.o.b. mill. The price for the 1924 season to be determined after investigation by a tribunal, but not to exceed £27 per ton.

Another dry period was experienced in 1923, which was especially felt in the districts below Townsville. The Maryborough, Isis, Bundaberg, Mackay, and Lower Burdekin areas harvested poor crops. This low yield was compensated for by the excellent crops in all districts above Townsville. Although it was one of the driest years experienced, the yield of cane and sugar per acre in the far North was high. This bears out the general impression that dry years in the wetter districts of the North, such as Innisfail and Babinda, usually produce much better crops than do very wet seasons. No real droughts have ever occurred in Innisfail and Babinda, where the rainfall (though only about half the average in 1923) reached 78 and 94 inches respectively from 1st January to the end of October. The sugar crop for this year was 269,175 tons.

A tender for the erection of the Tully Mill was let this year to Walkers Limited, of Maryborough, the construction work being in the hands of Messrs. Barbat and Sons, of Ipswich. The clearing of the land for the mill site was commenced, and preparation made for the erection of the mill buildngs. Farmers, too, that year were busy clearing their holdings and getting in cane, and there was, even at that time, a considerable population and four stores.

An important event took place in December of this year when the through line from Brisbane to Townsville was opened, which again opened up new country, particularly north of Mackay as far up as Bloomsbury.

In January, 1924, a tribunal appointed by the Commonwealth and State Governments, as provided for in the Agreement of 1922, made investigations into the industry. The basis of the inquiry was to be the cost of efficient production in reasonably good districts, and under normal conditions, and the price fixed was not to exceed £27 per ton. This tribunal, after careful investigation, concluded that the price of £27 per ton for raw sugar was fair and reasonable.

Following on perhaps the severest drought experienced in many of the sugar areas, 1924 proved an excellent season. The drought persisted into January, but after that the rains were plentiful and well distributed, and the crop was a record one, the yield of sugar being 409,136 tons, of which it was necessary to export 74,000 tons overseas. This was the commencing year of the export trade in sugar, which has continued ever since.

During this year Messrs. Bennett, Bell, and Kerr were sent abroad to receive special training in the sugar industry, in sugar-mill technology, sugar-cane diseases, and soil physics and chemistry, respectively.

The erection of the Tully Mill was proceeding this year, and tramway work and bridge building was going on rapidly. A large area of

scrub had been fallen, and numerous business places were established. A temporary school with about seventy-eight children on the roll was also opened.

In 1924 the last link of the main line from Brisbane to Cairns was completed by the placing in position of the last span of the Daradgee Bridge, over the Johnstone River, and in December passengers were able to travel by rail from Brisbane to Cairns.

The Babinda Mill was this year taken over from the Government by the farmers concerned.

In April, 1925, a conference of those interested in the milling and growing of cane was called by the Minister of Agriculture, when the position as to surplus sugar was carefully reviewed. It was then determined that the whole of the season's crop of cane should be harvested, and that the making of the necessary arrangements as to the marketing, &c., should be left in the hands of the Sugar Board.

During this year (1925) the embargo was extended for three years as from the 31st August, 1925, under certain conditions as to prices and concessions to manufacturers.

A Royal Commission in the person of Mr. T. A. Ferry, who was then Under Secretary to the Chief Secretary's Department, was appointed to inquire into and report on the social and economic effect of the increase in number of aliens in North Queensland. This will be dealt with in a subsequent section.

Later in the year trouble arose with the export sugar through an unfortunate dispute on British ships. In consequence, large quantities of sugar remained in mill stores, and some of the mills had to erect increased storage accommodation to meet the situation.

Industrial unrest on interstate vessels and the railways also affected the industry, and some of the mills had to close down for a period, thus extending the crushings into less satisfactory months of the year. A rotary strike of wharf labourers at Cairns and Innisfail had the effect of holding up for some time the transport of sugar to Australian refineries.

Proposals for the erection of a distillery at Plane Creek were made this year to utilise molasses and cassava for the purpose of manufacturing power alcohol.

The yield of sugar this season was particularly good, being 485,585 tons—the record to date. This meant a big export which reached 211,000 tons. This large surplus having to be sold overseas at world's prices caused considerable loss, and gave rise to much discussion. Many schemes were brought forward with the view of alleviating the trouble, including proposals for the allocation of quotas to the various mills. The principal reason for the surplus sugar, however, was the large increase in the area devoted to canegrowing, and also in the number of canegrowers. This was in a great measure due to the opening up of new lands by the North Coast Railway to Cairns. In 1920 the area cultivated amounted to 162,619 acres, the number of canegrowers being 3,930, while in 1925 the area under cane was 269,509 acres, an increase of 106,890 or 65 per cent., and the number of growers of cane of 5 acres and over was 6,730 or 2,800 more than in 1920, an increase of 70 per cent.

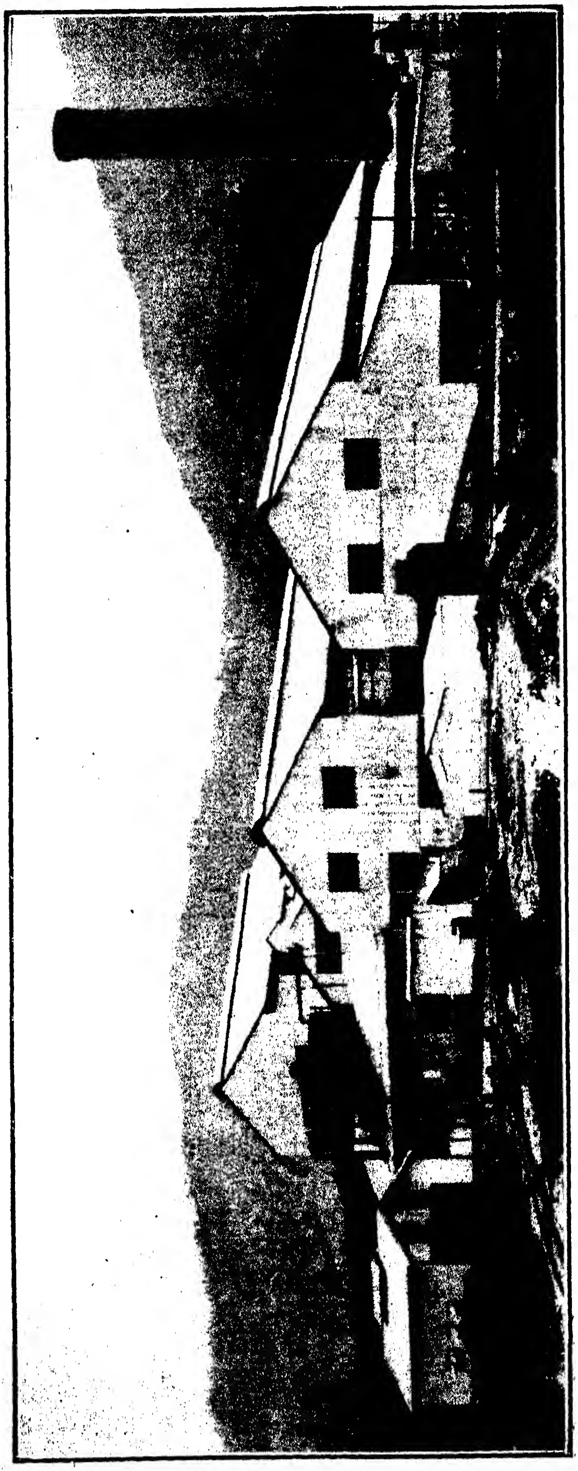


Plate 106.—Central Sugar Mill, Tully.

The largest sugar-mill in Australia—viz., the Tully—was completed this year with a short crushing, which did not commence till November, so that the operations were more in the nature of a trial run.

By this time much settlement had taken place in the Tully area, due to the opening of the mill and the completion of the railway to Cairns. What had been an inaccessible unpopulated belt of jungle two or three years previously was now carrying an ever-increasing settlement of farmers and business people, who were speedily opening up roads and establishing cane farms and a township with all the modern adjuncts of civilisation.

In the following year, 1926, the crop was considerably affected by dry weather conditions, in those districts south of Townsville more especially. A most unusual occurrence this year was the large amount of damage done by frosts on the Herbert River. Frosts also caused losses in Mackay and in the more southern sugar areas.

The Queensland Cane Growers' Council was created this year by Act of Parliament, entitled "*The Primary Producers' Organisation and Marketing Act of* 1926," which provided that for the sugar industry there should be constituted—

(*a*) Mill Suppliers' Committees,
(*b*) District Canegrowers' Executives,
(*c*) The Queensland Cane Growers' Council.

These bodies were to manage the affairs of the sugar industry generally, and the Cane Growers' Council was authorised to convene an Annual Sugar Industry Conference, while special conferences might be convened by the Council on matters of urgent business as the said Council might deem desirable, also to raise levies to be expended for the benefit of the industry generally or locally.

The power alcohol industry in Queensland was also initiated this year by the erection of a factory and distillation plant at the Plane Creek mill, Mackay. At the outset it was proposed to utilise molasses together with a starch-bearing plant known as cassava, of which about 100 acres had been planted around Plane Creek. The distillation from cassava roots, however, was subsequently abandoned. At the time it was estimated that a ton of molasses would yield some 65 gallons of power alcohol. The factory did not commence operations till the following year. The estimated cost of erection at that time was about £35,000.

The Farleigh mill, which had been owned by a private firm, was taken over by the farmers this season.

The sugar yield in 1926 was almost 100,000 tons below that of 1925, only amounting to 389,272 tons. In consequence the export was much lower—viz., 74,777 tons, as compared with 211,000 tons in 1925.

During the following year (1927) consideration was given by the Central Cane Prices Board to cane assignments, and the secretary visited a number of districts for the purpose of collecting information to enable the Board to determine the areas to be assigned to growers.

This year a co-operative association of farmers took over the South Johnstone Sugar Mill from the Government, and this led to great industrial turmoil at the mill, lasting from May till September. During this strike much bitterness was engendered, a picket was shot, stone-throwing and assaults were common, and finally the railways became

involved, which led to the dismissal of practically the whole staff and their re-engagement a few days later. Finally the strike was settled, though the farmers had to work the mill at first with one shift, and afterwards with two shifts; also volunteer labour was engaged for a time. The mill, however, was unable to crush all the cane due to loss of time, and the tonnage was reduced from about 207,000 to 155,000.

The power alcohol distillery at Plane Creek was opened this year, but met with manufacturing difficulties, and further additions were necessary.

The 1927 season was, on the whole, favourable to growth, though a cyclone at Cairns and disastrous floods at Innisfail and Ingham caused considerable loss. The worst feature of the Ingham floods, however, was the heavy loss of life by drowning fatalities, which tragedies will remain in the memories of many people for years to come. The loss of cane in the northern areas affected by the cyclone and floods was estimated at the time to be about 120,000 tons.

Frosts did considerable damage in the Moreton area this year, and to some extent also at Bundaberg. Mackay had a very fine crop, amounting to upwards of 101,000 tons of 94 net titre sugar.

The yield for the State was 485,745 tons of 94 net titre sugar; this was somewhat higher than in 1925, and constituted the record to date. The export sugar was 152,384 tons.

In 1928 the Agreement between the Commonwealth and State Governments for continuance of sugar prices and the maintenance of the embargo was renewed for another three years, the Federal Government reserving the right to revise Australian prices if increased preference was granted to export sugar from Australia by Great Britain or any Dominion. The subject of this preference has not yet been alluded to, but will be dealt with in the section on prices later on.

The 1928 season was wet in all sugar districts in the earlier part of the year, and excessively wet in the South. The rains were followed by a long period of dry weather, which induced an early arrowing of the crop, more particularly from Mackay north. Serious floods, cyclones, and frosts were not experienced, and labour worked steadily and well throughout the year. Some waterside trouble, however, was present, and difficulties with storage accommodation were in evidence, and many farmers had to come to the rescue and load and even man small sugar vessels in order to get their sugar away.

The commercial cane sugar in the cane was high this year, and the output constituted the largest tonnage of sugar ever manufactured in Queensland—viz., 520,620 tons of 94 net titre sugar. The tons of cane required to make one ton of sugar that season were the lowest up to that time—viz., 7·18. The export of sugar was 186,703 tons.

In 1929 the crop was not so large due to frosts in the southern areas, long continued dry weather in some places, and considerable grub damage in northern sugar localities. The sugar made reached a total of 518,516 tons of 94 net titre sugar, while the tons of cane required to make one ton of sugar was even below that of 1928, being 6·91. The commercial cane sugar in the cane was remarkably high in 1929.

Having brought this history up to 1929 in a general way, it is proposed to deal with mills and mill work in the next article.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Always Select Good Seed Cane for Planting.

The importance of careful seed selection cannot be over-estimated, this being one of those common-sense methods which is bound to yield favourable results. Nature never makes a mistake. Throughout both the animal and vegetable world one finds an unalterable law to the effect that "like produces like"; in other words, we shall always reap the same kind of thing that we sow. What would you think of an orchardist who, when propagating young apples or peaches, was to carelessly take the buds from unhealthy trees or from those which he knew bore fruit of inferior quality?

Do not forget that it is quite possible for any canegrower to thoughtlessly introduce into a clean plantation insects or fungus diseases which in the course of a few years will inevitably reduce his yield of cane very materially. When planting, reject any sets showing tunnels of the weevil borer at the cut ends. Do not obtain same, if you can avoid doing so, from a plantation or even from a locality known to be borer-infested. Such seed often harbours young larvæ of this beetle, which later on may so riddle a set as to make it useless for support of the young cane, thus causing unsightly misses. In the Burdekin district care must be taken to select seed which is free from tunnels of the "Giant Termite." When using top plants of Badila or other soft varieties a lookout should be kept for the presence of moth borers, external indications of which are betrayed by surface tunnels more or less blocked by webbing covered by pellets of excreta.

Entomological Work should Interest Canegrowers.

I would again emphasise the fact that more interest could, with advantage, be shown by our cane farmers in practical nature study in connection with the economy of the various insects occurring in canefields. Unless able to tell friends from foes, certain useful parasitic or predaceous species might easily be mistaken for injurious insects and be promptly destroyed. When uncertain of the habits of wasps, beetles, caterpillars, &c., they should be dropped into a little bottle containing methylated spirits and water (half and half strength) and sent to the Entomologist for identification and advice. We are always pleased to see growers at the Meringa Experiment Station, where an interesting collection of insects is on view, which comprises about 2,200 different species, and considerably over 7,000 specimens. In addition to this general collection, our Museum contains many handsome showcases depicting the life-history of primary cane pests, coloured diagrams, and numerous spirit specimens of insects, &c., of a miscellaneous nature. This Station is one of the rail motor stops, and can be reached from Cairns in about three-quarters of an hour.

Keep a Lookout for the Weevil Borer.

At the present time, during the milling season, growers are advised to look now and then at the cut ends of cane being harvested. In the event of these beetle borers chancing to occur on a plantation, conspicuous evidence of their tunnelling will at once be revealed at those places where the cane knife has severed the basal ends of such infested cane sticks. In cases where this insect appears likely to obtain a footing, the farmer concerned should at once communicate with the Entomologist at Meringa Experiment Station.

VICTORIAN BEET-GROWERS AND THE EMBARGO.

The following extracts, taken from a report in a Gippsland (Victoria) paper, of a meeting of the beet-growers at Maffra recently with the Victorian Minister for Agriculture (Hon. W. Slater), the Hon. T. Patterson, M.H.R., Federal Representative of the district, and Mr. J. W. McLachlan, M.L.A., State member, are interesting at the present juncture, and indicate that the sugar industry of Queensland is likely to have the Victorian beet-growers behind it in connection with the embargo.

Mr. Noble, President of the Beet Growers' League, said:—"The position arising from a review of the sugar agreement by a committee appointed by the Federal Government not only occasioned concern to beet-growers but also to the State Minister for Agriculture, as it may affect the price of beet sugar as well as cane sugar in the near future. There was, therefore, a likelihood of growers being faced with more serious problems than confronted them at present. They would have to await the decision of the Federal Government in regard to the fate of the sugar industry in Australia."

Councillor T. W. Murphy, of Lindenow, said: "The future of the industry is at present in the clouds," and he hoped that "the Federal Government would prevail in regard to the agreement; it would be suicidal to interfere with the development of so great an industry." He hoped the Minister would use his influence to have the Sugar Agreement retained.

The State Minister for Agriculture said: "Possibly the agreement would be subject to modification, and that being the case, it must affect the beet-growing industry in the Maffra district, and also the price. One speaker had suggested that Victoria should be supplied exclusively from the beet factory by the industry being expanded. It was, however, utterly impossible to disregard the sugar industry as a whole. It was too late in the day for one State to put up barriers against another State. The expansion of the cane-sugar industry had been remarkable." He intended to recommend to Cabinet that prices for next season's beets be as follows:—

Up to 15 per cent.	40s. per ton.
Over 15 up to 15½ per cent.	41s. per ton.
Over 15½ up to 16 per cent.	42s. per ton.
Over 16 up to 16½ per cent.	43s. per ton.
Over 16½ per cent.	44s. per ton.

If, however, the retail price of sugar be reduced, the beetgrowers will be paid 1s. a ton less for every £1 a ton reduction. The minimum price paid to growers would be 35s. a ton.

Mr. Foley said: "Drop the price for the Melbourne housewives, and we will give up growing beet."

The Minister: "They will realise the difficulties confronting the beetgrowers."

Mr. Foley: "The Housewives' Association says, 'Shut up the beet factory.' "

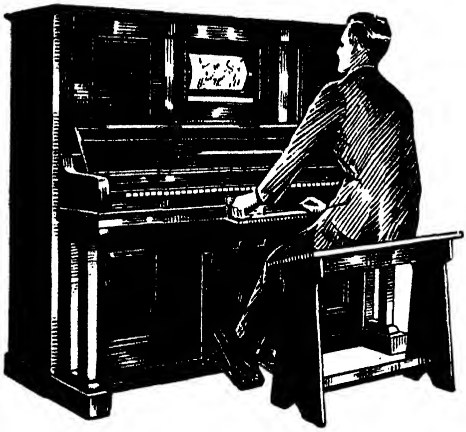
The Minister said that some of his own constituents wanted to grow beet, but he could not support their requests, in their own interests. "When the cane-sugar product fell below the requirements of Australia then you could expand your industry to your heart's content, but it would be inadvisable to do at present."

Mr. McLachlan: "What is the Queensland Sugar Agreement?"

The Minister: "The price Australia has to pay for keeping the industry white."

SUGAR INCOMES.

The Director of the Bureau of Sugar Experiment Stations, Mr. Easterby, remarking on a paragraph in the Press of the 30th August, in connection with the report of the Commissioner of Income Tax, said recently that the figures did not indicate a particularly prosperous state of the sugar farmer, seeing that less than 13 per cent. pay income tax, while the remaining 87 per cent., apparently, do not make enough to pay tax. The figures show that 2 per cent. of the cane farmers pay on incomes of from £1,000 to £2,000; 4.2 per cent. on incomes of £500 to £1,000; and 6.6 per cent. on incomes from £250 to £500. For an industry that is continually being represented as being so highly prosperous the fact that 87 per cent. of the farmers engaged therein do not make enough to pay income tax is a rather startling commentary, and bears out the contention that sugar-growing is in the hands of a large number of struggling farmers.



THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART III.

NATURAL ENEMIES.

THESE can be considered under three headings—parasites, diseases, and predators.

The word "parasite" will be used not in the strict zoological sense, but to be applied to enemies living on or in individual cutworms.

No intensive study of the parasitism of *Euxoa radians* has been made, but the following are the deductions from observations of three seasons. Parasites of the egg and larva have been found, and it is probable that the pupa is subject to some of these also.

Egg Parasites.

Small chalcid wasps (Plate VIII., fig. 7) were found to parasitise the eggs of *Euxoa radians*. These chalcids were identified by A. A. Girault as *Schedius euxoæ*. They were noted as being abundant in December, 1926,[1] but have not since been found in great numbers.

Larval Parasites.

A tachinid, *Ballardia pallipes* Curran,[10] first bred out by E. Ballard from the larvæ of *Euxoa radians*, has been found fairly often in cutworms near Brisbane. During the seasons under review, however, it has not been common in any of the areas which have been visited. In October, 1928, out of eighty cutworms three flies of this species emerged.

A large tachinid was bred out from material collected in the Mundubbera district during October, 1927, but the identification has not yet come to hand. It has not been found to be numerous in any area so far.

An unidentified braconid wasp (Plate VIII., fig. 6), probably belonging to genus *Apanteles*, has been bred from material collected at Biloela, Gatton, and from the suburbs of Brisbane. It is a small black wasp about 2 mm. in length and about 4 mm. from tip to tip of the out-spread wings. The adult emerges from a white cocoon by a circular lid at one end. The pupation period in summer is about five to six days.

A cutworm larva may be parasitised by this braconid in any of the last three instars, and sixty larvæ of the parasite have been seen to emerge from a single specimen of *Euxoa radians*. Of eighty cutworms collected at Brisbane in October, 1928, six were parasitised by this braconid. In October, 1926, a collection of cutworms at Gatton showed that out of sixty individuals 78 per cent. were parasitised, but at Biloela in October, 1927, only two out of 1,200 cutworms were found to be parasitised by the braconid.

PLATE VIII.

Parasites and Predators.

Fig. 1. Bombyliid fly (*Villa* sp.) ex pupa of *Euxoa radians* Guen. x 2.

Fig. 2. Tachinid fly ex immature stage of *Remigea frugalis* Fabr. x 2.

Fig. 3. Tachinid fly *Ballardia pallipes* Curr. ex larvæ of *Euxoa radians* Guen. x 2.

Fig. 4. Sphegid wasp *Ammophila suspiciosa* Sm. Adult female collects larvæ of *Euxoa radians* Guen. as food for her own offspring. x 2.

Fig. 5. Ichneuman wasp *Lissopimpla semipunctata* Kirby, ex pupa of *Remigea frugalis* Fabr., x 2.

Fig. 6. Braconid wasps (*Apanteles* sp.) ex larvæ of *Euxoa radians* Guen., x 10.

Fig. 7. *Schedius euxoæ* Girault, ex eggs of *Euxoa radians* Guen., x 35.

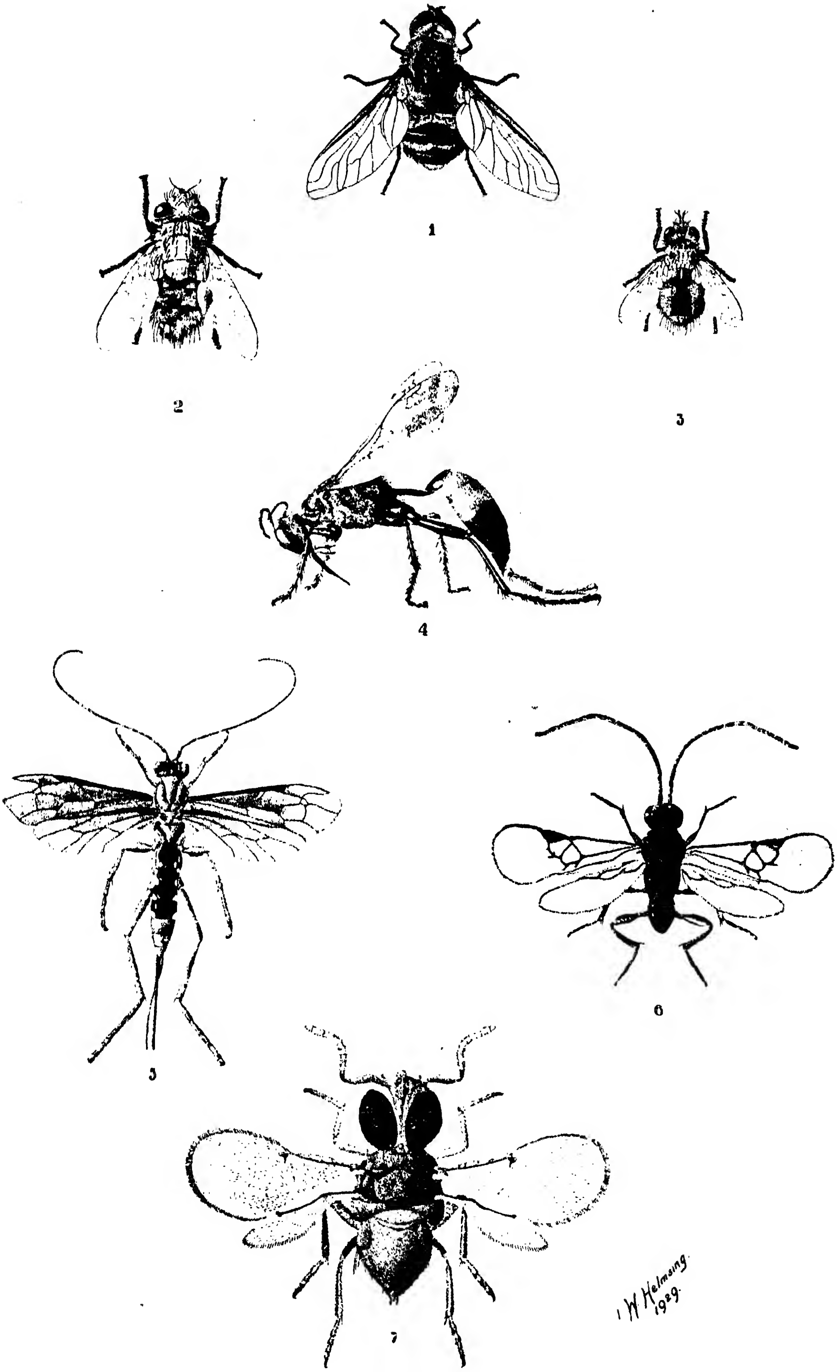


Plate VIII.

This wide diversity of results shows how impossible it is to form an idea of percentage of parastism without collections of cutworms being made at regular intervals over a long period and in different situations. The application of biometric methods to the interpretation of results is most essential in this connection.

On various occasions dark brown hymenopterous eggs have been found attached to the prothorax of the bigger sizes of *Euxoa radians* larvæ. They have hatched out into ectoparasitic hymenopterous larvæ, but have not yet been bred through for identification.

In connection with parasitism in general, it was observed that certain habitats were more favoured by one parasite than by another, so that the control value of the parasite would vary with the habitat of the cutworm. For example, cutworms working in a field which was well covered with grass and herbage intermingled with such food plants as pigweed were more heavily parasitised by the small braconid wasps than they were in more exposed situations with little cover. On the other hand, the open field with little cover was favoured by the hymenopterous predator to be described later.

It seems clear that if the cutworms were breeding in a habitat favoured by some parasite with a wide catholicity of taste in lepidopterous larvæ, it would be much more subject to attack by that parasite than if it chose some situation not so favoured. This would be particularly true where the cutworm had a wider range of tolerance of natural surroundings than any particular parasite might possess.

Pupal Parasites.

In October, 1928, Mr. L. M. Hodge, manager of the Cotton Research Station, Biloela, bred out a Bombyliid of the genus *Villa* from the pupa of *Euxoa radians*. This is the only observation of this nature recorded. (Plate VIII., fig. 1.)

Newman[11] published a photograph of a dipterous and of a hymenopterous parasite of *Euxoa radians*. The fly belongs to the Tachinidæ, and he considered the hymenopteron to be a member of the genus *Ophion*.

Diseases.

Deaths from causes other than parasites, predators, mechanical injuries, or poisons can be considered under the heading "diseases."

Septicæmia is a well-known cause of cutworm deaths, and in the Queensland experiments now under discussion large numbers of larvæ died showing symptoms of some such ailment.

A recent Russian work[12] on cutworm septicæmia established the following points:—

Cutworms which had died showing symptoms of septicæmia were examined bacteriologically and three organisms were isolated. These were *Bacillus agrotidis typhoides, Micrococcus saccatus* Nugula and *Bacillus subtilis* F. Cohn. All cutworms inoculated with any or all of these organisms developed symptoms of septicæmia after one or two days and

eventually succumbed. Cutworms fed on food infected with these organisms gave a much lower percentage of positive results than those inoculated with the organisms. This held true even when external conditions were most favourable to the development of the disease—i.e., high temperature with high humidity. Under these conditions only 50 per cent. of the larvæ succumbed to feeding on infected material.

Symptoms of the disease in these experiments was a sluggishness and failure to feed on the part of the larvæ, followed by flaccidity of the body and death; subsequently the dead body often became mummified.

In the case of *Euxoa radians,* high temperatures combined with high atmospheric humidity were conditions predisposing to disease. In 1926, at Biloela Research Farm, it was found most difficult to keep cutworms alive in the laboratory during the muggy weather in the latter part of December. In the field, too, the incidence of the pest suddenly decreased with the onset of wet conditions. In the laboratory at Brisbane hundreds of cutworm larvæ died off within a few days of the onset of hot humid weather in February, 1928.

The symptoms of the disease were as follows:—A caterpillar would cease feeding and its fæces would become fluid and muddy. During daylight, instead of resting well buried in soil under cover, it would be positively phototropic and come to the surface to lie there sluggishly. Sometimes it would climb upwards on any object offering a foothold and cling to the top. When the temperature of the air was high, the larva would frequently move restlessly about, obviously ill at ease and losing co-ordination between the different parts of its body. The dorsum became suffused with a pink flush and ventrally a curdy white appearance was seen. Death supervened in an hour or two in high temperature, but took longer at low temperature. The dead body was a loose sack of dirty fluid.

In the Mundubbera area on the Burnett River, a heavy attack of cutworms was experienced in October and November, 1926. A widespread epidemic broke out amongst the cutworms, mostly sixth instar larvæ being affected. Enormous numbers climbed up fence posts, clung there and died, the bodies then shrivelling up. This marked the end of the serious damage for that season.

The pathogenic organisms have not been isolated in the case of *Euxoa radians,* but there seems little doubt that the predisposing causes are high atmospheric humidity and high temperatures.

In the laboratory, conditions which encouraged the survival of cutworm larvæ obtained when temperatures ranged from 62 deg. Fahr. to about 80 deg. Fahr. daily and relative humidities from 40 to about 80 per cent., with an average about 60 per cent. In the field, where maximum temperatures in excess of 90 deg. Fahr. were frequently experienced for short periods during the day, with night temperatures about 10 deg. Fahr. and "medial" relative humidities, conditions were very favourable to cutworm survival and rapid development.

The range of humidities and temperatures experienced during November, when cutworm larvæ were thriving well and had no losses is given below, contrasted with a week in February when the cutworms were dying off rapidly.

TABLE VII.

AVERAGE TEMPERATURES AND HUMIDITIES FOR ONE WEEK DURING NOVEMBER, 1927, IN WHICH CUTWORMS WERE HEALTHY AND NO LOSSES OCCURRED.

Date.	Temperature, °F.		Relative Humidities, %.		
November.	Maximum.	Minimum.	9 a.m.	3 p.m.	9 p.m.
1st	79·9	61·7	53	52	77
2nd	81·2	62·1	58	51	74
3rd	80·6	67·0	57	53	76
4th	81·5	66·2	62	57	83
5th	85·1	67·0	86	40	74
6th	80·4	62·1	57	51	74
7th	80·7	67·2	65	51	74

AVERAGE TEMPERATURES AND HUMIDITIES FOR ONE WEEK DURING FEBRUARY, 1928, WHEN CUTWORMS WERE DISEASED AND DYING OFF RAPIDLY.

Date.	Temperature, °F.		Relative Humidities, %.		
February.	Maximum.	Minimum.	9 a.m.	3 p.m.	9 p.m.
14th	84·2	72·1	85	71	97
15th	85·2	73·7	87	81	88
16th	87·7	74·9	96	88	90
17th	77·3	74·6	92	99	89
18th	79·3	74·4	95	93	95
19th	83·0	74·4	88	93	93
20th	79·5	72·3	94	99	83

A few cases occurred where cutworms newly dead contained fungus growth, and a white fungus covered the body after a short period.

Some pupæ died having fungus growth protruding through the spiracles, but in no case was this common in the period under review, and no identification was made.

Predators.

Birds are effective enemies of insects in general and lepidopterous larvæ render heavy toll to them. Domestic poultry and more particularly turkeys devour large numbers of larvæ. Once they have found the cutworm larvæ hiding just under the surface, they will most assiduously search for them.

Wild birds of insectivorous orders soon congregate to the feast when very heavy attacks of caterpillars are in progress, although cutworms seem to be more immune from this form of control than the larvæ of *Heliothis obsoleta,* which do not hide in the soil. The pee-wee or Magpie Lark (*Grallina cyanoleuca*), the Grey or Collared Butcher Bird (*Cracticus torquatus*), the Pied Butcher Bird (*Cracticus nigrogularis*), the crow (*Corvus cecilæ*), the Pied Crow Shrike or Pied Currawong (*Strepera graculina*), and the Straw-necked Ibis (*Threskiornis*

spinicollis) have been seen eating cutworms, and the adult moths may be snapped up by these and other birds.

The larvæ of some carabid beetles have been seen to attack and devour cutworm larvæ, while spiders may sometimes catch the adults in their webs. Being general feeders, however, these forms are not likely to act as effective controls.

A most useful predator on *Euxoa radians* larvæ was observed at work in the field at Biloela during the seasons of 1926, 1927, and 1928. This is a predatory wasp *Ammophila suspiciosa,* which is included as a predator in spite of the fact that her larvæ live ectoparasitically on the cutworms. Her own habit of actively searching for cutworms is predatory. The female is about an inch in length and has a slender petiole to the abdomen. (Plate VIII., fig. 4.) The head, thorax, legs, petiole, and caudal half of the abdomen are black, while the rest of the abdomen is a rich yellow brown. The wings are transparent, and of a reddish brown shade. The males are much smaller than the females. The females work during sunny hours and are found in dull weather resting under maize leaves or some other cover of a similar nature. In October, November, and December they are to be seen visiting the flowers for nectar in the sunshine or searching diligently for their prey.

The female, with the urge of the future upon her, first digs a hole almost vertically into the ground, of a width sufficient to allow her easy ingress. The forelegs and mandibles only, seem to be used in digging, the earth being thrown back in a fine shower. Suddenly she stops digging and runs off in search of a cutworm. Her movements are jerky and her bearing alert as she runs rapidly amongst the vegetation like a terrier hot on a scent. She stops, digs in a flurry, and drags forth a squirming larva which is quickly stung into a state of paralysis. She then grips it on the ventral surface between the head and the first pair of thoracic legs, swings it under her, and runs off rapidly astride her victim's motionless body.

When nearing her burrow she ascends some eminence such as a clod, stick, or plant and lays the cutworm carefully thereon, then flies to the hole.

There she digs furiously, carrying a load of earth up to the surface, returning for another, backing out with that, and so on till she feels that the depth is sufficient. She then returns for the cutworm, carries it to the burrow, and herself entering first backwards, pulls it down after her, head first. Almost immediately she reappears and starts scratching the earth back into the hole. When some earth has been sent down she runs down the hole and butts it firm with her head, repeating this at intervals until surface level is reached.

When the hole is almost completely filled she chooses a stone of suitable size, places it on the entrance and then beats the earth round it into position. After patting the surface flat and smooth she flies off.

On being dug up the burrow is found to be about 2½ inches deep, nearly vertical, and at the bottom the larva is coiled up with the large

white sausage-shaped *Ammophila* egg fixed to one of the anterior abdominal segments. Only larvæ in the fifth and sixth instars were chosen by the wasp as food for her offspring.

A small grey fly about the size of a house fly, with yellow bands on its abdomen (probably a bombyliid) often accompanies the female in her search, and sits by on a convenient stone while the burrow is being opened up. Whenever the prey has been pulled into the hole the fly hurls itself down after it, emerges again almost immediately, and would appear to be parasitic on the *Ammophila* larva.

The subterranean and nocturnal habits of cutworms give some immunity from many natural enemies, but the digging wasp has the secret of finding them out in their hiding places.

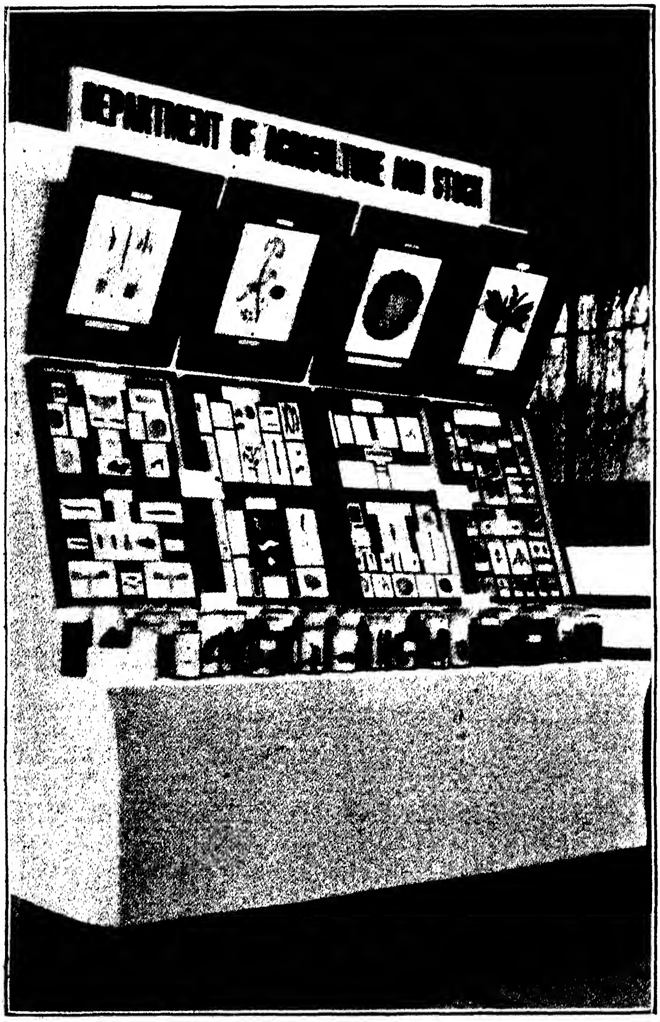


Photo: J. H. Weddell.

Plate 107.—Display by the the Division of Entomology and Plant Pathology at the recent Cleveland Show.

BRIGHT TOBACCO IN NORTH QUEENSLAND.

Compiled by N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

In the subjoined notes Mr. Pollock gives some interesting particulars of prospective tobacco producing country in the North, together with an account of tests made on leaf produced in the seasons 1927-28 and 1928-29. They will be welcomed by all concerned with the opening up of new furrows in agricultural development in this State.—Ed.

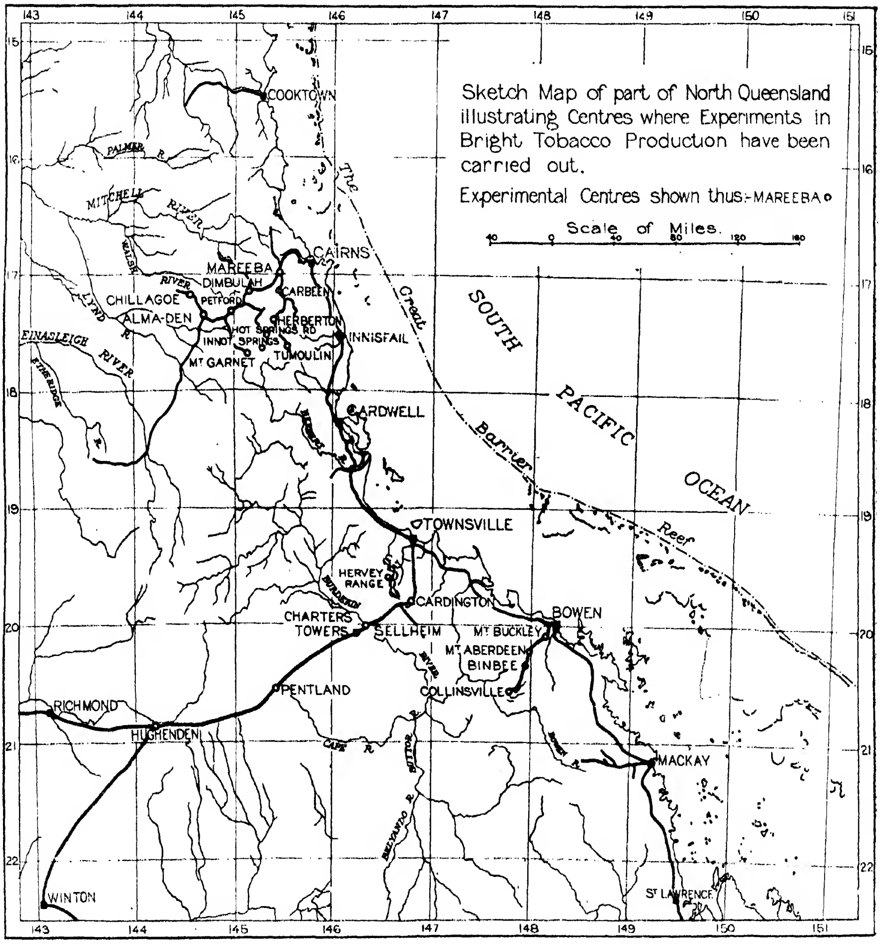
THE initial experiments in the production of bright tobacco for pipe and cigarette smoking carried out by the Queensland Department of Agriculture in collaboration with the Australian Tobacco Investigation, in a series of exploratory plots in the 1927-28 season, tested an area of some 30,000 square miles of country, from the latitude of Mareeba in the north to that of Bowen in the south, a distance directly of 250 miles, and inland to Pentland and Chillagoe, distant respectively 180 and 96 miles due west from the coast.

The localities of these plots are shown on the accompanying map, as at Mount Buckley, Mount Aberdeen, Binbee, and Collinsville on the Bowen to Collinsville Railway; Hervey's Range, some 25 miles from Townsville, on the old Georgetown road; Cardington, Sellheim, Charters Towers, and Pentland on the Great Northern Railway; and Mareeba, Dimbulah, Petford, Alma-den, Chillagoe, Mount Garnet, Innot Springs, Hot Springs road, Tumoulin, Herberton, and Carbeen, which are centres on the highlands west of Cairns; and the volcanic soils of the Atherton Tableland.

These plots, twenty-five in number, were grown on various classes of soil commonly met with that were considered as possibly suited for the production of bright tobacco. The results were uniformly good, giving evidence that a very large proportion of bright leaf could be cured from crops grown in each district, while the qualities of burn, texture, and aroma under test were most encouraging.

Culling from the progress report of the Australian Tobacco Investigation to January, 1930, and Bulletin 2 of that Investigation entitled "The Smoking Qualities of Australian Tobacco," a preliminary report presented to the Executive Committee by C. M. Slagg, M.Sc., Director of the Australian Tobacco Investigation, the following evidence of the superior quality of bright tobacco leaf grown in North Queensland is offered:—

"In general, the texture and colour of the 1928 experimental leaf from North Queensland was quite good. A high percentage of bright colour was obtained, and in addition to a fair quantity of thin cuttery tobacco, the fillers and wrappers showed good elasticity and the quality of retaining pliability and a soft velvety feeling even when exposed to a dry atmosphere for long periods. Smoking tests were made on all samples, and the burn and ash were found excellent. The aroma, while


Sketch Map of part of North Queensland illustrating Centres where Experiments in Bright Tobacco Production have been carried out.
Experimental Centres shown thus:- MAREEBA
Scale of Miles
COOKTOWN
CAIRNS
MAREEBA
DIMBULAH
CHILLAGOE
PETFORD
ALMA-DEN
CARBEEN
HERBERTON
HOT SPRINGS RD
INNOT SPRINGS
TUMOULIN
INNISFAIL
MT GARNET
CARDWELL
TOWNSVILLE
HERVEY RANGE
CARDINGTON
CHARTERS TOWERS
SELLHEIM
BOWEN
MT BUCKLEY
MT ABERDEEN
BINBEE
COLLINSVILLE
PENTLAND
RICHMOND
HUGHENDEN
MACKAY
WINTON
ST LAWRENCE
PALMER R.
MITCHELL RIVER
WALSH RIVER
LYND R.
EINASLEIGH RIVER
ETHERIDGE R.
CAPE R.
SUTTOR R.
BELYANDO R.
The Great Barrier Reef
SOUTH PACIFIC OCEAN

different from American tobacco, and also different from the aroma of tobacco thus far tested from other parts of Australia, was for the most part mild and not definitely objectionable.

The leaf from all twenty-five plots was graded into 136 lots, which Mr. Slagg tabulated as follows:—

Grades.	Per cent.	Colours.	Per cent.
Lugs	7·10	Lemon	19·44
Cutters	20·93	Orange	45·56
Wrappers	5·49	Bright mahogany	8·29
Fillers	66·48	Mahogany	26·71
		Dark	0·0
	100·00		
			100·00

TABLE IV.

Summarised Comparative Aroma of some Selected 1928 Australian Tobacco Samples.

State.	Number of Growers' Crops Tested.	Number of Lots Tested.	Lots with Mild, Agreeable Aroma. No.	Lots with Mild, Agreeable Aroma. Per Cent.	Lots with Passable Aroma. No.	Lots with Passable Aroma. Per Cent.	Lots with Indifferent to Poor Aroma. No.	Lots with Indifferent to Poor Aroma. Per Cent.	Lots with Bad Aroma. No.	Lots with Bad Aroma. Per Cent.
Victoria	20	48	5	10	14	29	15	31	14	29
New South Wales ..	14	44	5	11	7	16	18	41	14	32
North Queensland ..	25	136	44	32·5	60	44	30	22	2	1·5
South Australia	13	29	2	7	6	21	9	31	12	41
Western Australia ..	19	27	4	15	9	33	9	33	5	18
Tasmania	1	6	0	0	2	33	4	66	0	0
	92	290	60	..	98	..	85	..	47	..

TABLE V.

The Comparative Burn (Combustion) of some Selected 1928 Australian Tobacco Samples.

State.	Number of Growers' Crops Tested.	Number of Lots Tested.	Number of Lots with Good to Excellent Burn.	Number of Lots with Indifferent to Fair Burn.	Number of Lots with Poor to very Poor Burn.
Victoria	20	48	44	3	1
New South Wales ..	14	44	43	1	0
North Queensland ..	25	136	136	0	0
South Australia	13	29	2	24	3
Western Australia ..	19	27	12	12	3
Tasmania	1	6	6	0	0

"All of the North Queensland 1928 lots were retested for smoking qualities after twelve months ageing in a packed condition. The aged samples were compared directly with the samples cut from the freshly-cured leaf in 1928. In nearly every case the aroma was found to be

better in the aged samples. The aroma was mellower and better rounded out, lacking much of the sharpness and pungency exhibited by the samples cut before ageing.''

It will be noted from the foregoing that while no comparison of grades and colours is instituted with leaf grown elsewhere, those with aroma and burn are outstandingly in favour of that from North Queensland.

A regrettable feature of tobacco leaf produced in southern latitudes of which complaint has been made is its failure to improve when aged. North Queensland leaf, on the other hand, according to Mr. Slagg, has shown definite improvement with age.

In consequence of the uniform results obtained in all the districts tried, it was decided by the Australian Tobacco Investigation to establish an experimental tobacco farm at Mareeba, since that district, besides offering excellent climatic conditions, provided very large areas carrying the class of soil considered most suitable for production.

Evidence in this connection extracted from the report of the Select Committee on Tobacco Growing in Australia is as follows, Mr. R. W. Howell, Superintendent of the Tobacco Experiment Station at Mareeba, being the witness:—

> Question 4622. *By Mr. Slagg:* Did you take part in the tests made with Queensland leaf in 1927 and 1928?—Yes.
>
> Question 4623. Do you recollect that in those tests we found very little difference in the smoking qualities of the flue-cured tobacco obtained from the 1927-1928 exploratory test plots over a wide range of country extending from Bowen in the south to Mareeba in the north, provided that the soil conditions were approximately similar?—Yes, they were practically identical.
>
> Question 4624. Do you also recollect that it was on that account that we decided to concentrate our experimental work to North Queensland, at Mareeba?—Yes. The area chosen for experimental work was selected because it was representative of a large area of country that possessed soil and climatic conditions conducive to the production of the best tobacco. It thoroughly represented the North.

During the seasons 1928-29 and 1929-30 further trials were conducted at this farm under the supervision of an officer of the Investigation with a wide knowledge and lengthy experience of tobacco culture, while in other districts at Pentland, Charters Towers, Hervey's Range, and Chillagoe, crops on a commercial scale and on experimental areas were supervised by officers of the Department of Agriculture.

The result from these further trials was, in each instance, to repeat the success obtained in the exploratory plots and to establish the fact that bright tobacco possessing good burning qualities, accompanied by a pleasing and agreeable aroma, such as would be acceptable to the smoking public of Australia and which would be readily purchased by the manufacturers, could be produced on the poor sandy soils of the Mareeba and other districts of North Queensland possessing similar climatic conditions.

The prices received for the various grades of leaf purchased by the British-Australasian Tobacco Company Pty., Ltd., Sydney, from the

small crops grown at Pentland, Charters Towers, and Hervey's Range, respectively, were, including bonuses:—

PENTLAND.

Grade.	Price per lb. s. d.
Lemon	3 5
Bright mahogany	3 0
Mahogany, lugs	2 2

CHARTERS TOWERS.

Variety: South's Improved Hester—	s. d.
Lemon, long	3 0
Lemon, short	2 2
Bright mahogany A	3 4
Bright mahogany B	3 1
Short bright mahogany A	2 1
Long mahogany A	3 0
Short mahogany A	1 7
Long mahogany B	2 0
Short mahogany B	1 6
Variety: White Stem Orinoco—	s. d.
Lemon	3 6½
Lemon scrap	3 0
Long bright mahogany A	3 3
Long bright mahogany B	3 1½
Short bright mahogany B	2 2
Long mahogany C	2 1
Short mahogany C	1 9

HERVEY'S RANGE (Townsville District).

Variety: South's Improved Hester—	s. d.
Lemon, long, 1A	3 6
Lemon, short, 1A	3 3
Lemon 1B	3 8
Lemon, scrap	3 3
Orange, long	2 2
Orange, short	1 6
Orange, lugs	2 0
Mahogany A	3 1
Mahogany B	3 0
Variety: White Stem Orinoco—	s. d.
Lemon	3 7
Orange A	3 4
Orange B	2 1
Orange, lugs	3 0
Mahogany A	2 1
Mahogany B	1 4

All the crops from which these lots of leaf were marketed had been sown rather late in the season and had experienced frost to such an extent as to disallow the computation of the weight of leaf per acre; they were, however, estimated to yield between 500 and 700 lb. per acre. In the prices obtained, those of 3s. and over included a bonus addition of 1s., those of 2s. and over of 3d., while those under 2s. received no bonus addition.

Plate 108.—A Portion of this Year's Crop at the Experiment Station, Mareeba. Note the class of soil.

Plate 109.—On the Experiment Station at Mareeba, showing a Portion of the 1930 Crop and Flue-curing Barn and Bulk Store.

In forwarding the account sales the purchasers remarked:—

"We need hardly point out to you on the present valuations of these small lots of leaf and assuming a normal season with a normal crop, the resultant yield to the grower would be extremely profitable on our present valuations without any bonus being paid."

Dealing with the grades of leaf from these centres together with a lot grown at Chillagoe and that produced at the Tobacco Experiment Station at Mareeba, Mr. Slagg, in his preliminary report, advises as follows:—

1929 North Queensland Plots.—In addition to leaf grown at Mareeba, a total of five outside plots was also cured and tested. Extremely wet weather during the growing season interfered seriously with the growth of all plots except those at Chillagoe. However, some leaf was secured from most of the areas, and smoking tests made. Due to the unfavourable season, the leaf texture was much heavier than in 1928. The leaf colours, however, were better, due to the fact that there were larger lots of leaf available for curing at one time, and to a new and better curing kiln being built. Two private kilns were also constructed, one at Hervey's Range, near Townsville, and one at Charters Towers. Most of the leaf grown at Hervey's Range, and all of that grown at Charters Towers and Pentland, was cured in these kilns. One small lot of Hervey's Range tobacco was transported to Mareeba and cured there. The summarised data on leaf texture, colour, and aroma follow:—

Texture.—Of seven exploratory test plots in North Queensland in 1928-29, two, or 29 per cent., were rated as possessing a very good texture, and five, or 71 per cent., as having a good texture.

Colour.—Eight per cent. was lemon, 76 per cent. was orange, 10 per cent. was mahogany, and 6·5 per cent. was dark.

Aroma.—Of a total of thirty-three lots tested, 82 per cent. were rated as possessing a mild and agreeable aroma, 15 per cent. were passable or fair, and 3 per cent. possessed an indifferent to poor aroma.

1928-29 Exploratory Test Plot Summary.

The following tables show in summarised form the data for 1928-29 from the exploratory test plots in the different States. It must be pointed out, however, that it is very difficult to assort properly into a small number of classes of texture and colour, leaf produced on different and widely-separated soils. The aromas encountered are also of widely differing character, even when mild and agreeable.

Summary of Leaf Texture in Exploratory Test Plots 1928–29.

State.	No of Plots.	Percentages.					
		Very Good.	Good.	Fairly Good.	Fair.	Poor.	Very Poor.
Victoria	8	..	..	25	..	75	..
North Queensland	7	29	71	..	..	..	..
South Australia	15	..	..	..	7	73	20
Western Australia	20	..	..	20	25	30	25

SUMMARY OF LEAF COLOURS IN EXPLORATORY TEST PLOTS, 1928–29.

State.	Number of Plots.	Percentages.				
		Lemon.	Orange.	Mahogany.	Dark.	Nondescript.
Victoria	8	0·1	15·7	58·4	3·2	22·6
North Queensland	7	7·8	75·9	9·8	6·5	..
South Australia	15	..	..	34·2	59·1	6·7
Western Australia	20	1·1	10·9	62·3	5·0	20·7

SUMMARY OF SMOKING AROMA IN EXPLORATORY TEST PLOTS, 1928–29.

State.	No. of Exploratory Plots.	No. of Lots Tested.	Percentages.			
			Mild and Agreeable Aroma.	Passable or Fair Aroma.	Indifferent to Poor Aroma.	Bad Aroma.
Victoria	8	34	17	21	24	38
North Queensland	7	33	82	15	3	..
South Australia	15	18	..	6	55	39
Western Australia ..	20	35	40	29	28	3

The superiority of North Queensland leaf over that grown elsewhere is again outstanding in the features of colour, texture, and aroma that are considered when purchase is made by manufacturers.

Crops grown in the North during the season 1929-1930 have not yet been reported on by Mr. Slagg, but it is understood equal if not better results will be forthcoming. The result of a small crop grown in the Bowen district during this season, in proportion of bright colour, texture, burn, and aroma, gives promise of comparing very favourably with that produced in other Northern centres.

Further support of the suitability of North Queensland for bright tobacco production will be noted in the following sworn evidence given in the inquiry of the Select Committee on Tobacco Growing recently concluded:—

Evidence given by Mr. C. J. Tregenna, Tobacco Expert, Department of Agriculture, N.S.W.—

> Question 1299. Would you be prepared to smoke cigarettes made half of Australian and half of American leaf?—If the Australian leaf came from Stawell, in Victoria, or North Queensland, a 50-50 mixture with American tobacco would give a satisfactory cigarette. The position would be quite different if tobacco grown in Tamworth, Manilla, or Tumut were used.
>
> Question 1341. Do you think that ultimately almost the whole of our tobacco requirements will be produced in Australia?—Yes.
>
> Question 1342. Do you think that that tobacco will be produced in the existing areas?—I think it will come from North Queensland.
>
> Question 1359. What is your opinion of North Queensland as a tobacco-growing area?—It is the only place in Australia that I

have visited which I think will produce high-grade tobacco. I think that we can grow there tobacco which will displace much of the American product now imported.

Question 1360. To what parts of North Queensland do you refer?—The country around Mareeba. The leaf grown there is the best Australian leaf I have seen.

Evidence given by Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Department of Agriculture, Queensland—

Question 4389. What percentage of bright leaf do you anticipate can be produced from the Mareeba lands?—In normal seasons the most suitable land in the Mareeba district could produce almost 100 per cent. bright tobacco if handled by experienced labour; certainly over 90 per cent.

Evidence of Mr. R. W. Howell, Supervisor, Australian Tobacco Investigation, stationed at Mareeba Experimental Station, North Queensland—

Question 4577. Do you expect a crop of half a ton to the acre?—No; 500 to 750 lb. would be as much as we could expect. Perhaps with very favourable seasons one could expect a half a ton to the acre.

Question 4578. Do you expect to get 100 per cent. bright leaf off the land?—Very nearly. I have seen 100 per cent. bright leaf gathered at Mareeba. At a conservative basis, I would average it from 80 per cent. to 90 per cent. bright leaf.

Question 4579. *By Mr. Jones:* Do you class mahogany as "bright"?—Only bright mahogany.

Question 4580. Do you get much lemon leaf in the Mareeba district?—I have seen crops cured in that district with 100 per cent. lemon leaf. I have never seen a similar result in America. My report gives a coloured percentage for twenty-two plots, some of which were planted in very heavy ground that could not be expected to produce good tobacco.

In the foregoing evidence the reference to Mareeba lands may be taken to refer generally to all districts in which bright tobacco has been produced in North Queensland, for the results tabulated by Mr. Slagg and referred to in his report were the outcome of examination of leaf from all districts without consideration to any specific locality. So it may be understood that leaf of excellent quality may be produced in the Bowen to Collinsville areas and Townsville, Charters Towers to Pentland areas equally with that of the Mareeba and other centres on the highlands west of Cairns and the volcanic areas of the Tableland.

Soils.—The soils in all districts tested for tobacco-leaf production are very similar, being sandy, varying slightly in depth, character of subsoil, texture, and fertility, but all proved as capable of producing leaf of good colour, texture, and smoking quality. Such soils were derived very largely from granitic rocks, as well as from sandstones, of the desert and other series, but, of whatever origin, have proved suitable for tobacco production. It cannot be said that the soil of any one district is superior to that of another, but certain classes considered most suitable will, of course, vary in their extent in different districts. The most favoured soil is that of fine sandy character, light in texture, preferably of a foot or upwards in depth, that is naturally well drained or so situate as to easily be made so.

Plate 110.—Harvesting Leaf, Hervey Range, 1930
Note how lower leaves ripen first.

Plate 111.—Tobacco Crop, Experiment Station, Mareeba, 1930.

Climates.—While soils as far as character is concerned suggest no great superiority of one district over another, the climates certainly differ. While all are satisfactory for the health and wellbeing of the settler, being more pleasant, perhaps, in those of the highlands than in those of lower altitude, the degree of atmospheric humidity, prevalence or otherwise of direct sunshine, distribution of rainfall, and degree of evaporation are factors in the production of leaf quality which allow of discrimination.

Thus districts contiguous to others of heavier and more persistent rainfall, such as those on the highlands west of Cairns and the volcanic area of the Tableland, enjoy a more suitable degree of atmospheric humidity, a prevalence of passing clouds, allowing intermittent shade, with consequent lower evaporation and a more even temperature, as well as a better distributed rainfall, than do others less favourably situated.

Altitudes.—The altitudes of the districts proved for bright tobacco in North Queensland have had no effect on the quality of leaf produced, that at Mount Buckley, 91 feet above sea level, being equal to that grown at Tumoulin, 3,162 feet above sea level. The following are the altitudes above sea level of the localities where the exploratory plots were grown:—

	Feet.		Feet
Mount Buckley	91	Carbeen	1,988
Mount Aberdeen	336	Herberton	2,890
Binbee	642	Tumoulin	3,162
Collinsville	601	Dimbulah	1,512
Hervey's Range	1,400	Petford	1,577
Cardington	330	Mount Garnet	2,131
Sellheim	835	Innot Springs	2,200
Charters Towers	1,004	Hot Springs road	2,250
Pentland	1,318	Almaden	1,617
Mareeba	1,325	Chillagoe	1,154

Season for Tobacco.—To produce the best quality of tobacco leaf it should be grown in the warmest months of the year when sufficient rainfall is experienced. This, in North Queensland, coincides with the rainy or wet season, which commences usually in December and embraces the following months of January, February, and part of March.

Tobacco plants are raised in seed-beds, sown usually during the second or third week of November, which are watered by hand to allow of plants four to six weeks old being available for setting out in the field shortly after the first falls of rain, opening the wet season, have provided a sufficiency of moisture in the soil.

Growth will then be made through January and February and the leaf ripen for harvest in March and April, when finer weather can be expected to prevail.

Rainfall.—The monthly average rainfall, during the growing season, of recording stations nearest to the localities where exploratory plots were grown are detailed as follows:—

District.	December.	January.	February.	March.	April.
	Inches.	Inches.	Inches.	Inches.	Inches.
Bowen	4·46	10·20	8·97	4·71	2·88
Townsville	5·58	11·29	11·46	7·56	3·54
Charters Towers	3·55	5·54	4·51	3·92	1·63
Pentland	3·62	6·77	4·58	3·68	1·51
Mareeba	4·29	9·32	7·48	7·46	2·87
Mount Garnet	5·32	7·16	5·63	5·58	1·77
Herberton	5·72	9·52	7·67	8·93	5·06
Chillagoe	6·00	8·01	4·10	5·82	1·40

Tobacco Varieties.—While sufficient data has not yet been secured to indicate the most suitable variety for any one district, the uniformly good results obtained with the Hickory Pryor and Warne varieties wherever tried enables them to be recommended.

PROPOSED TOBACCO SETTLEMENT.

In view of the evidence adduced that the production of bright tobacco in suitable districts of North Queensland will prove a profitable industry to the grower, and tend to obviate the necessity of sending huge sums yearly overseas for Australian requirements in that direction, the Queensland Government has decided to make available for immediate settlement, under specially favourable conditions, areas in the Mareeba district, which have been specially selected with due attention to ease of access, soil quality, water supply, &c., as ideally suited for tobacco production on a commercial scale. The designs of these areas into 26 and 10 portions respectively are now available.

Areas.—It will be noted that the maximum area of any portion is 219 acres and the minimum 105 acres, and that the amount of first-class tobacco soil on each farm will range from 65 to 126 acres.

Soil.—The soil suggested for tobacco production on each portion is a sandy soil of fine texture a foot and upwards in depth over a decomposed granitic subsoil or cement, comparing more than favourably with that on the Tobacco Investigation Farm, near Mareeba.

Water.—Most of the portions have frontages to creeks with permanent water, but on five or six portions it will be necessary to sink wells to provide water during the dry months, July to December. These wells, however, will not be very deep and will tap a sufficient supply for all requirements.

Topography.—Level to gentle slopes.

Access.—The portions designed on Granite Creek will be served by a siding 7 miles from Mareeba, on the Chillagoe Railway, which is within the area and from which the furthest farm is less than 3 miles distant, and also by road from Mareeba. The portions designed at Dimbulah will be served by the Dimbulah Railway Station, which is within 3 miles of the furthest farm by an easy road.

Flora.—The natural grasses on each area are mainly Kangaroo (*Themeda* sp.), Bunch and tall Spear (*Heteropogon* sp.), Blady (*Imperata* sp.), and others of little fodder value. The trees and shrubs on the soils suggested for tobacco are largely Bloodwood (*E. corymbosa*), Western Bloodwood (*E. terminalis*), with occasional examples of Grey Box (*E. Leptophleba*), Narrow-leaved Ironbark (*E. crebra*), Poplar Gum (*E. Alba*), Bluegum (*T. tereticornis*), Cabbage Gum (*E. papuana*), Moreton Bay Ash (*E. tesselaris*), and species of Acacia, Grevillea, Alphitonia, Melaleuca, &c.

Clearing Costs.—The trees, while being plentiful, are not large, so that clearing costs will not be heavy. It is not anticipated that a cost of £12 per acre will be exceeded on any portion, an average being estimated at £9 per acre. When the trees have been killed by ringbarking or poisoning for two years, it is expected that clearing costs will be reduced by 50 per cent. when tree pullers are used in the wet season.

General.—The areas exhibit absolutely virgin soil, no occupation in any form having ever taken place. While there are large areas of similar soil in the district of equal quality, preference was given to these areas for immediate occupation owing to their ease of access, which will facilitate the cropping of 5 acres on each farm desired during the coming season.

DESCRIPTIVE NOTES OF THE MAREEBA DISTRICT AS A SUITABLE TOBACCO-GROWING AREA.

Town.—Mareeba is an important town on the railway, 46 miles inland from Cairns, which is connected by rail with Townsville and Brisbane, distant, respectively, 211 and 1,043 miles.

It is a busy railway centre, being the junction of the Tableland and Chillagoe Railways, and also the point of departure for trains on the Mount Molloy line, which junctions with the main line to Cairns at Biboohra, 5 miles distant.

The town is situated at the confluence of Granite Creek and the Barron River, and has a population of approximately 1,500 inhabitants. It is well laid out and possesses an excellent water supply, which is pumped from the Barron River to reservoirs and thence reticulated throughout. Excellent conveniences exist in a general hospital, banks, telegraph and post office with telephone exchange, court house, hotels, stores, &c. The bacon factory of the Atherton Tableland Co-operative Bacon Company is situated at Floreat, within a mile of the town, and an up-to-date meatworks will be found at Biboohra 5 miles on the railway towards Cairns.

District.—The country, presently included, in the Mareeba district, extends for perhaps 8 miles east and southward and for upwards of 40 miles north to south-westward of the town.

Altitude.—The altitude above sea level ranges from 1,325 feet at Mareeba to slightly over 2,000 feet in other parts, the major portion having an average altitude of around 1,500 feet.

Climate.—The climate is an excellent one, extremes of heat and cold being very rare. A maximum shade temperature of 100 degrees is rarely encountered, while frosts in winter seldom occur.

Though situated in the tropical zone and within 17½ degrees of the Equator, the unpleasant steamy heat peculiar to the tropical coast in summer is not experienced, owing to the higher elevation and lighter average annual rainfall, and the nights are invariably cool.

Suitability for Tobacco.—The climate is considered to be ideal for the production of bright tobacco, since the daily temperatures in the growing season rarely exceed 90 degrees in the shade by day or fall below 70 degrees at night. Being contiguous, in addition, to the heavier rainfall area extending from Cairns in the east to the Tableland in the south, a desirable degree of atmospheric humidity is maintained, which with the intermittent shade from passing clouds disallows excessive evaporation, and thus permits that evenness of growth and progress to maturity so desirable in the production of high-class tobacco leaf.

Rainfall Statistics.—The rainfalls recorded at the Mareeba Post Office will apply very generally to the whole of the district. From these records it is noted that the annual average rainfall over a period of

thirty-two years is 34·92 inches, while the monthly average precipitation for the same period is—

	Inches.		Inches
January	9·31	July	0·32
February	7·48	August	0·17
March	7·46	September	0·26
April	2·87	October	0·56
May	0·52	November	1·23
June	0·51	December	4·29

Soils.—The soils, it is understood, compare very favourably, especially in texture, with the best of those occurring in the bright tobacco-producing districts of the United States of America. They are generally derived from the disintegration of granitic rock and characterised by a desirable degree of fineness with a very small proportion of clay.

In the total elements of fertility they must be classed as poor, especially in phosphoric acid and nitrogen content, while that of potash and lime can be classed as but fair.

The amount of humus and decaying organic matter is low, but sufficient for some years before the necessity for a supplement, by ploughing under a growing crop, will arise.

Value for Tobacco.—Generally speaking, the soil is of a character that will allow a ready response to the application of fertiliser, and in this connection is admirably adapted for tobacco production since the growth of the plant can be regulated by the amount of fertiliser applied.

Depth of Soil.—The depth to which these soils occur are from 12 inches to several feet, occasionally over a porous clayey subsoil, but generally bottoming on decomposed granite or a cement.

Drainage.—Tobacco soil areas occur, for the most part, on gently sloping ridges and possess, generally, a good drainage under ordinary falls of rain. Provision, however, is advisable in deep, open drains to carry off the surplus of storm waters and the seepage from higher levels.

The tobacco plant is adversely affected by saturated soil conditions, but in a recent instance tobacco plants growing on an area so drained at the Tobacco Experiment Farm successfully withstood a phenomenal rainfall of 15 inches in a week.

Water Supplies.—The district under review may be described as excellently watered, for though most of the streams are perennial, a number cease to flow during the dry months, from June to December. During this period, however, water can be obtained in sufficient quantity for requirements under the sands in these creeks, or in wells nearby, at no great depth. In the months of heaviest average rainfall—from December to March—water supplies are abundant in all directions.

Topography.—The country varies from comparatively level, through gentle slopes, to hilly, and offers little difficulty in obtaining easy gradients in roadmaking throughout. During heavy rains little or no damage can be expected from flood waters.

Tree growths occur as an open forest and comprise in Eucalypts principally Bloodwoods (most common on tobacco soils), Grey Box, Narrow-leaved Ironbark, Poplar Gum, Cabbage Gum, Blue Gum, and Moreton Bay Ash, with species of Acacia, Grevillea, Alphitonia,

Plate 112.—Tobacco Crop at Hervey Range

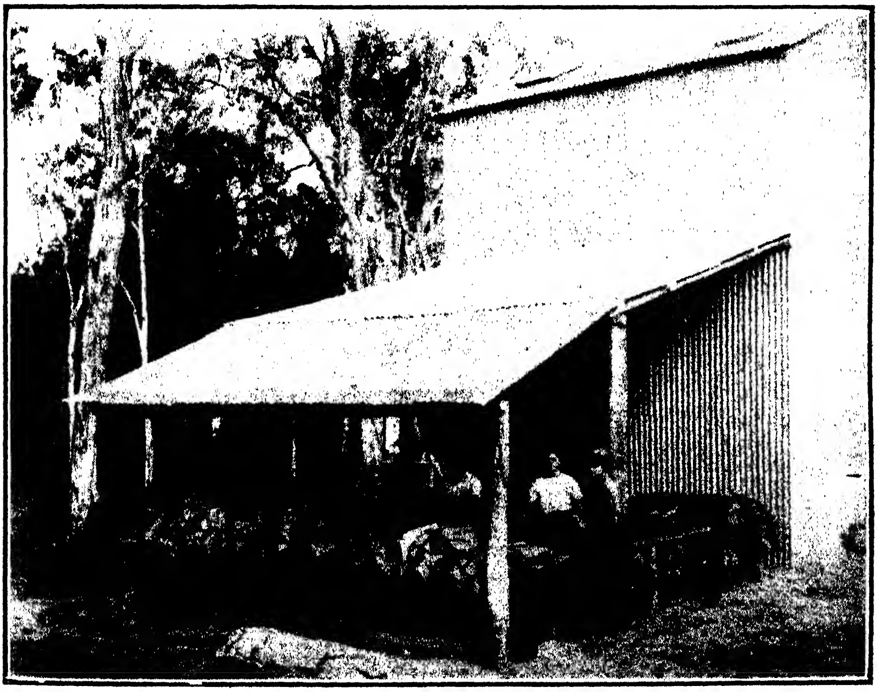


Plate 113.—Stringing Tobacco Leaf Preparatory to Placing in the Flue-curing Barn, Hervey Range, 1930.

Erythrophloeum (Ironwood), Casuarina, Callitris (Cypress pine), &c. In certain parts Cypress pine is rather plentiful, but most often on country that is somewhat broken.

Clearing Costs.—The cost of clearing the land preparatory to production will not be high in any case, and is not expected to exceed an average of £10 per acre for green timber, and a good deal less if the trees have been killed for a couple of years. During the wet season, when the soils readily yield, economy in this direction will be obtained by the use of tree-pulling machinery.

TOBACCO PRODUCTION.

The combination of an ideal climate, faultless soil with a suitable rainfall, indicates the district of Mareeba as eminently adapted for the production of high-grade tobacco leaf. While seasons of light rainfall occur as in other parts of the State, an insufficiency to secure a crop is regarded as extremely unlikely.

Weight of Crop.—The return of cured leaf per acre can be expected to vary according to season, soil, and the variety grown. Taking a standard variety, such as Hickory Pryor, which has proved eminently adapted, the yields in a normal season may be expected to range from 450 lb. to 750 lb. on soils suggested as most suitable, the average yield of 600 lb. per acre being regarded as probable.

Value of Crop.—When properly grown and cured the lighter crops almost invariably yield larger percentages of the highest grades of leaf. With a present protective tariff of 3s. 6d. per lb., the value of superfine leaf would command a price approaching 5s. per lb., while all leaf graded bright would bring not less than 3s. per lb. As results up to the present have indicated a production of at least 80 per cent. of bright colour within these yields, it might be safe to calculate on an average return of 3s. 6d. per lb.

Assuming, however, that an average crop would be 500 lb. and that the average price was 2s. 6d. per lb., which is a most conservative estimate, the yield would be £62 10s. per acre; at an average of 3s. it would be £75, and at an average of 3s. 6d., the sum of £87 10s. per acre would be obtained.

Cost of Production.—An estimate of the cost of production in the United States published some four years ago was stated to be £27 1s. 8d. per acre.

Allowing for less skilled labour, and making provision for depreciation of buildings, &c., the maximum cost of production in North Queensland should not exceed an amount of £35 per acre, but be somewhat lower.

Profit on Growing.—Allowing cost of production at £35 per acre and gross return at the lowest estimate of £62 10s., the net profit would be £27 10s. per acre, which is very considerably more than the average net return secured with an acre of any other crop at present grown commercially.

Times of Planting.—The most suitable time for transplanting from seed-bed to field is suggested as from mid-December to mid-January, or shortly after the first heavy falls of rain occur in the wet season. This will necessitate the sowing of the seed-beds between the first and third weeks of November.

It takes usually from seven to ten days for tobacco seed to germinate, and it is considered inadvisable to set out in the field plants older than eight weeks, those four to six weeks old being most desirable.

Harvest of Leaf.—The tobacco leaf should ripen through March and April, and, in general, be all cured by May.

Marketing.—Bulking and grading operations may be expected to occupy attention through May, June, and July, allowing market to be completed in the month of August.

Value of Other Crops.—Except with tobacco, commercial success is not considered possible with crops climatically suited to the district, since the cost of fertilisers necessary for growth on the poor soil, coupled with an expected low return and the small prices to be expected, would allow any net profit secured to be insufficient to provide a reasonable living.

As rotative crops, however, from which the tobacco crop will benefit, the growth of sorghum varieties, which includes broom millet, velvet beans and cowpeas for seed, sweet potatoes, and cotton are suggested as practicable.

TOBACCO GROWING IN NORTH QUEENSLAND.

CONDITIONS OF SETTLEMENT.

In the course of a recent announcement, the Minister for Agriculture and Stock, Mr. Harry F. Walker, said that the scheme adopted by the Government to stimulate the production of bright tobacco leaf in North Queensland provides for the opening up of twenty-five portions of land in the Mareeba district for selection under the group system as agricultural homesteads, the purchase price being 2s. 6d. an acre, payable in annual instalments of 3d. per acre over a period of ten years, when a freehold title will be available; or such may be obtained at the expiration of the first five years (during which personal residence is obligatory) by paying the balance. Under the Act, improvements to the value of a fence around the block must be effected within the first five years.

In order to ensure the cropping of 5 acres this coming season with tobacco, since there would be insufficient time after occupation is effected for the selector to do so, Mr. Walker said he had arranged with the Minister for Labour and Industry, Mr. Sizer, that such an area on each portion should be grubbed, cleared, and ploughed, the work of grubbing and clearing to be carried out by local unemployed under the relief scheme, and the ploughing by contract, after tenders had been invited.

It was also decided that the young tobacco plants necessary to plant up each 5 acres should be raised in community seed beds, under the supervision of an officer of the Department of Agriculture, who would also be deputed to locate the site for the 5 acres of cultivation on each farm, and to see that its preparation was satisfactorily accomplished.

The Main Roads Commission is to provide all equipment, in camp gear, tools, &c., and officers to control the work in co-operation with the representative of the Department of Agriculture. The initial expenditure will be charged to the unemployed relief fund, which will later be recouped by payments from the selectors concerned, spread over a term of years, for the actual cost of the grubbing and clearing, if such does not exceed £12 an acre, and, at the rate of £1 per 1,000, for the plants obtained. It is not thought that an average amount of £12 for grubbing, clearing, and ploughing each acre will be exceeded, but, if it is, any excess will be borne by the unemployed relief fund, and not charged to the selector.

In the contract to be signed, provision is made for the ploughing to closely follow the clearing, so that both operations will be concluded by the middle of November at latest.

Early last month fifty unemployed workers, in local centres, were transported to the job, camps fixed, the necessary tools provided, and the work commenced.

It is understood, from the number of inquiries in hand, that applications in excess of the number required will be made for the portions available, in which case allotment will be made in the usual way by ballot.

As applications will be received up to 14th October, it is expected, allotment and notification of successful applicants being made immediately thereafter, that occupation will take effect about the first week in November.

The first job of the settler will be to make a camp, after which he should go on with fencing and securing necessary tools and implements, as well as horses or other tractive power.

Very shortly after this, the erection of the flue-curing barn and bulk shed should be undertaken. Though harvesting operations will not be commenced until March, it will be a wise plan to have all necessary buildings erected in good time. Plans and specifications of these buildings will shortly be available from the Department of Agriculture.

As most of the settlers will have little or no experience of tobacco, it has been arranged that officers of the Department of Agriculture will be available to supervise all cultural operations and be on hand to give instruction in harvesting, curing, and subsequent operations, until the leaf is sent away for sale.

TOBACCO SEED BEDS.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THE production of strong, healthy plants, free from disease and insect infestation, that will most easily bear transplanting to the field and there make satisfactory growth, is a prime factor in successful tobacco-leaf production. Not only will such plants make better growth and reach a more even maturity, but they will, through their unimpaired vigour, offer a greater resistance to attack by disease than would others less well grown.

Soil.

A tobacco seed, being exceedingly small, can provide but a small amount of nourishment for the young seedling, which in consequence is soon forced to draw its food from the soil. A friable fertile soil of fine texture, with a good humus content and capable of easy reduction to a fine tilth, should therefore be selected for the seed beds. A sandy silt loam, or a fine textured alluvial, or other loam, is considered very suitable.

Where such a soil is not available on the holding, the existing soil can be built up by the addition of fine sand or heavy soil, whichever is called for, to improve the texture, and by the addition of well-rotted organic matter, either as leaf mould or animal manure, or both, to improve both texture and fertility. The manure, if used, should be well dug in some time before the seed beds are required in order to become thoroughly incorporated with the soil.

Drainage.

Good drainage is imperative for tobacco seed beds, since the seedling plants will not make a satisfactory growth on wet soil, and will also be liable to damage from fungus diseases so engendered.

Site.

The situation of the seed beds should be as sheltered as possible from strong winds, which are apt to damage the coverings (alluded to later on) and to dry out the soil. It should be such as to allow of easy drainage, if it is not naturally provided, and convenient for ease of access and attention. Proximity to a permanent supply of water is of the utmost importance. Tree growths should not be close enough to cast their shade on the beds or, through their roots, to rob them of food or moisture.

Area.

In calculating the area of seed bed required, though it is usual to allow 100 square feet as sufficient for each of the acres it is intended to plant, a surplus of 50 per cent. is considered advisable to allow for eventualities.

It is also advisable to make two sowings at intervals of two or three weeks in case sufficient rain does not fall to allow of setting out the first raised plants before they are too old. It is considered inadvisable to set out in the field plants that are older than eight weeks; plants four to six weeks old are much to be preferred.

Size.

The seed beds may be formed to any desired length, but they should not be of greater width than will allow ease of weeding or of lifting plants preparatory to transplanting. A satisfactory width for such purpose is 3 feet, with a distance of 2 feet between beds to make provision for pathways. The width of 3 feet corresponds with the width of butter muslin or cheese cloth, which material is regarded as very suitable for covering purposes.

Preparation.

The land, having been first cleared of all surface growth, should be thoroughly pulverised by ploughing or spading to a depth of 5 or 6 inches and brought to a fine tilth. The seed beds should now be marked out by drawing drills at intervals of 5 feet, to make the breadth of beds, and across these again for the lengths desired.

These drills should be the depth of the ploughing and approximately 18 inches wide, the soil therefrom being thrown back and spread over the beds thus formed. A double mould-board plough is very suitable, or an ordinary plough may be used. The beds will thus be 3 feet 6 inches wide, which will allow of the framework, enclosing the 3 feet to be seeded, resting thereon.

Sterilising.

Before further preparing the seed beds for sowing, the soil should be sterilised. There are several methods of doing this—viz: by steaming, applying boiling water, solutions of formalin or similar agents, but the most effective in general estimation, and recommended for Queensland growers, is the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material piled on the beds to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilisation of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undesirable as a deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insects, or other life that may cause damage to the young plants.

Another effect of burning the soil is to render the nitrogen content more readily available. The addition of the ash from the material burnt also tends to increase fertility.

Time to Burn.

The time to burn the seed beds is preferably a few days or a week before it is desired to sow the seed.

Final Preparation.

After the fire has burnt out and the soil is sufficiently cool, all unburnt pieces of wood and large charcoal should be removed and the beds and paths (disarranged when placing the firing material thereon) trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed beds, which at the same time should be reduced to the desired degree of fineness by digging and raking back and forth to a depth of 3 inches and finally levelled off.

Framework.

It is necessary for tobacco seed beds, more especially in North Queensland, to be shaded when the seed is germinating, as the heat from the direct rays of the sun is apt to scorch the young seedlings; it is also advisable for the beds to be protected against the ingress of insects which would be likely to cause damage. To get this effect satisfactorily and to allow of the covering used for shading not interfering with the growth of the plants, a frame or box with sides 6 or 7 inches high should enclose the beds. A suitable frame can be made of boards 6 or 8 inches wide; the ends of these should be squared so as to fit closely at the joins, over which a short piece of board or sheet iron could be nailed at the corners, when the boards should be nailed to each other and further protection afforded by sheet tin, such as a piece of a petrol tin, fixed to enclose the right-angle so formed.

The top of the frame should be even so that the covering will fit closely, and the boards should be sunk an inch or so in the soil and the soil on the outside heaped against them.

Protection against the ingress of insects is regarded as most important, since the setting out of plants in the field free of infestation, either in the form of eggs or larvæ, must be regarded as a distinct advantage. Other types of framework can be considered for use, but the main essential to be observed, while allowing for support of the shading, is to have them so constructed as to allow insufficient space for the entrance of even very small insects when the covering for shade is applied. The breadth of the framework should be commensurate with the width of the covering material used so as to allow ease of attachment. With material a yard in width a breadth of 3 feet overall is suggested as a limit.

Covering.

Provision for sufficient light and the circulation of air in the seed bed is necessary for the successful growth of plants. Choice of material for covering, especially in North Queensland, suggests consideration being given not only to a protection against the direct rays of the sun, which at the time of seeding is vertically overhead, or nearly so, at midday, but against rain storms likely to occur while the plants are being raised, which would tend to damage the young plants or to wash them out. Glass is probably the most effective all-round covering, but would require to be shaded during the hottest part of the day. The initial cost in the first instance would be considerable, but where operations are on an extended scale it will be likely to prove most economical over a period of years.

Cheese cloth or butter muslin, purchasable at small cost, secured across the framework usually makes a very satisfactory covering, but can be further improved by the addition of hessian, calico, or canvas placed tentwise or with sufficient pitch to run off heavy rain a little distance above.

When placing the covering of whatever material on the frames, provision should be made for its easy removal when watering or otherwise attending to the plants. Loops of tape sewn to the edges of the material to slip over nails or hooks on the outside of the frame with wires drawn taut or supported at intervals across or along the beds to prevent sagging will be effective, but perhaps the most satisfactory will be to attach the material to the underside of pieces of lath placed at intervals across the breadth of the frame with one at each end overhanging to keep the material stretched; the covering can thus be conveniently lifted or rolled back and as easily replaced.

Fertilising Seed Beds.

When the soil is of low fertility, or it has not been practicable to enrich it by the previous addition of manure, the application of a little fertiliser is suggested. In this connection it would be advisable to make use of a complete fertiliser, of which a suitable mixture would be 6 parts superphosphate, 3 parts of nitrate of soda or dried blood, and 1 part of sulphate of potash, applied at the rate of 1½ oz. per square yard of seed bed.

Where the beds have been burnt, however, there should be sufficient potash supplied in the ash from the firing, when a satisfactory application will be superphosphate at the rate of 1 oz. or a heaped tablespoonful evenly dusted over every square yard. Nitrate of soda could be added at the rate of ½ an oz. per square yard, or applied in solution by a watering can. Fertiliser should preferably be applied the day before sowing and brushed rather than raked into the surface of the soil.

Rate of Seeding.

Tobacco seeds being so small induce a tendency to sow too heavily. An ounce by weight will contain approximately 300,000 seeds, which quantity will fill a teaspoon to its level twelve times. A level teaspoon will thus contain about 25,000 seeds, which quantity is regarded as ample for 100 square feet of seed bed, unless the seed is known to be of low vitality. A heavy seeding results in a crowding of plants, which consequently make a spindly growth; another bad feature is that such crowding prevents the access of air and light to the soil, thus inducing the production of fungus diseases.

Time to Sow.

The time for sowing the seed beds will be regulated by a knowledge of the seasonal conditions usual in the district, the object being to have plants four or six weeks old when sufficient rain has fallen to ensure growth after transplanting. The best quality of leaf is grown during the warmest months of the year.

In North Queensland, where the rainy season usually commences in December, it is advisable to make sowings in the second and fourth weeks of November. It takes from seven to ten days usually for the seed to germinate; old seed sometimes takes up to fourteen days or longer. Seed thus sown can be expected to provide plants for setting out from mid-December to mid-January.

Sowing.

It is probable that the soil at the time it is desired to sow the seed bed will be rather dry; if this is the case a good watering is indicated a day or so before the seed is sown, since a heavy application immediately afterwards is not desirable.

When the moisture content is satisfactory the surface soil should be broken finely and then slightly compacted, as by the pressure of a board, to present an even and level appearance. To secure an even distribution of the seed over the seed bed will be extremely difficult unless some medium is used. In South Africa success is reported by distributing the seed, suspended in water by agitation, from a watering can with a fine rose. The usual method, however, is to mix the seed very thoroughly with fine dry sifted ashes, using a quart or more to that for each 100 square feet. In mixing, it is advised to take a bucket or similar receptacle and place a layer of ashes in the bottom, then sprinkle a pinch of seed over it, then another layer of ashes followed by a pinch of seed until the desired amount has been used up. The ashes and seed should now be thoroughly mixed by hand, and then poured from one bucket into another several times. By broadcasting this mixture over the bed the colour of the ashes will give an indication of the evenness of distribution. After the seed is thus sown it should be lightly pressed into the soil. This is performed by the use of a board, to the centre of which a handle has been vertically fixed. Some growers prefer to add a mulch after sowing; for this, dried and finely teased horse dung is very suitable, as it forms a mat over the soil which prevents disturbance of the seed when watering and is easily penetrated by the young seedling. It is advisable, however, in preventing the introduction of weed seeds or fungus spores, to sterilise this material by contact with boiling water or steam for ten minutes or so. Tobacco seed should not be covered too deeply, as germination will thereby be retarded if not prohibited; consequently any form of mulch used to cover must be in a very thin layer.

Watering.

Immediately after seeding the beds should be lightly and evenly watered and kept damp, but not wet, whilst under shade. A watering can with a finely perforated rose can be used, but a hose with a nozzle capable of giving a fine spray under pressure such as would be obtained with water laid on from an overhead tank would be more satisfactory.

The frequency of waterings will to an extent be regulated by the evaporation, but a light watering in early morning and late evening is preferable to a heavier watering once a day. When the seed has germinated and the plants have made some growth the watering can be effected more rapidly by using a rose with larger perforations on the watering-can or hose.

Hardening Off.

Plants grown entirely under shade would be too tender to withstand the shock of transplanting to the field, where bright sunshine would prevail; they should, therefore, be gradually hardened off by removing the covering when they are an inch to and inch and a-half high for an hour or two in early morning and late afternoon, gradually extending the period until they will bear the direct sunlight all day. The covering, however, should always be on the beds through the night or between sunset and sunrise, as most predatory insects on tobacco plants are night

fliers. When the plants are half grown the waterings should be lighter, but not enough to allow of the plants wilting.

Added Precautions.

As a preventive against fungus diseases the young plants can be sprayed with Bordeaux or Burgundy mixture, diluted to three-quarters the usual strength, to which might be added arsenate of lead, especially if grasshoppers are in evidence, as a protection also against insect attack. A spraying with arsenate of lead or Paris green the day before the plants are lifted for setting out in the field will afford a further protection, and is recommended.

Should the plants not be making satisfactory progress in the seed bed, or if it be necessary to accelerate their growth, the application of a liquid manure is advisable. This can be prepared by half filling a cask or similar vessel with cow, horse, or fowl dung, the last named being regarded as the best, and then filling up with water. After a few days, during which the contents should be stirred occasionally, the liquid can be used when diluted with nine or ten times its bulk of water to moisten the beds.

POINTS IN FALLOWING.

As the essence of fallowing is the storage in the soil of moisture precipitated before the seed is sown so that it may supplement that which falls during the growth of the plant, the time of the year at which the plough should be put in must be governed largely by the incidence of the rainfall. For the winter or ordinary fallow the initial ploughing or cultivation should be carried out not later than October in the year previous to sowing. Farmers employing this system of fallowing who have not yet performed the initial operation may be reminded of the following points:—

Ploughing should take place when the soil is neither too wet nor too dry. Sufficient moisture should be present to make it crumbly, so that it will not turn over in heavy, dry clods. If, on the other hand, the soil is too wet, ploughing will destroy its physical condition and it will dry out in hard lumps, from which state it will be very difficult to get it back into a good, free condition.

One of the objects of fallowing is the production of a suitable seed-bed, and this must be kept in view throughout the whole of the cultural operations that precede sowing if success in this direction is to be obtained. Even in connection with the first ploughing it must be considered. Though over the major portion of the wheat-growing area it is desirable to invert completely the top 4 to 5 inches of soil when ploughing the fallow to bury weed growth and admit air and moisture to the soil, the depth of ploughing should be regulated according to the nature of the soil, the rainfall of the district, and the time of ploughing. Turning up of sour subsoil should be avoided. On some types of soil it is very difficult to secure consolidation if the ploughing is deep because of the impossibility of obtaining compactness except in seasons of ample rainfall, and excellent fallows can be prepared on these by not ploughing more often than every two or three years. As rain is the most effective agent in compacting the soil, it follows that the less rain that is likely to fall on the fallow the more shallow should be the ploughing; therefore, in the case of districts of limited rainfall it is advisable to plough shallow; so, too, when the fallow is not ploughed sufficiently early. Farmers should be careful not to plough too many years at the same depth, as such a procedure is liable to result in the formation of a hard-pan. An occasional variation of, say, half an inch in depth will prevent this.

If the ploughing in one season is from north to south, it is advisable that the following year it should be from east to west, in order that the formation of deep furrows may be prevented. Many farmers for convenience plough the paddock round and round, but it is certainly a better method to plough in lands.

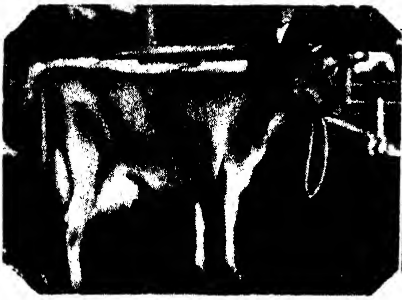
Much controversy exists among farmers as to whether the mouldboard or the disc plough is the better implement for the purpose. No hard-and-fast rule can be laid down, and the farmer must be guided to a large extent by the class of soil he has to handle and the condition it is in when making a choice between the two implements.

The mouldboard plough may be said to do better work in land that is likely to break up too fine, and is certainly superior to the disc on land covered heavily with weeds or other rubbish. On the other hand, the disc plough on fairly clean land has many advantages, chief of which is that from 400 to 500 acres can be ploughed with the one set of discs without renewing them. However, a great deal less depends upon whether the land has been ploughed with a disc or mouldboard plough than upon the choice of the right time, and the thoroughness with which the work is done.

DAIRY CATTLE AT THE BRISBANE SHOW.

The high standards attained by Queensland dairy cattle breeders were manifested impressively at the recent Brisbane Show, as may be judged from the accompanying camera record.

This interesting collection of Show ring favourites is presented through the courtesy of "The Queensland Dairy Farmer."

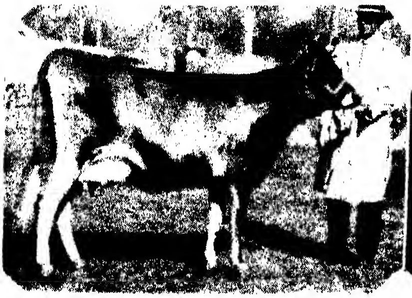


CARNATION LUCY'S LOCKET (4531), by Carnation Prince (1055); dam, Carnation Lucy (2277). First aged Jersey cow, in milk, and Reserve Champion. Bred and owned by W. Spresser and Son, Brassall, Ipswich.

TRINITY HAZELETTE (3841), by Ginger Duke (1276); dam, Oxford Hazel (2120). One of the fine team bred and exhibited by Mr. J. Sinnamon, Trinity, Goodna, Q.

DUCHESS OF CALTON (2080), by Clair Val Hero (imp., 695); dam, Trinity Montrose (App). First in Jersey butterfat test with 59.75 lb. milk and 2.660 fat in 24 hours. Bred and owned by John Collins, Tingoora.

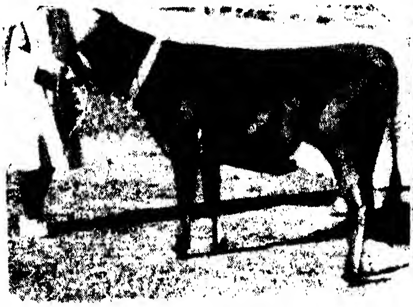
BELLEFAIRE SATISFACTION'S BELLE APPIN, by Werribee Prince Twylish; dam, Werribee Master's Satisfaction 2nd. A recent purchase from the South exhibited by Mr. A. S. Markwell, Beaudesert. She was just out of a place in the 18 months class.



QUEENIE OF CHELSFORD (7290), by Zenobia's Mascot of Woodstock (2653); dam, Sweet Clare of Chelsford (4426). Exhibited in yearling class by G. A. Ferguson, Woodhill. She was Champion at Beaudesert, 1930.

CARLYLE LARKSPUR 14th (7220), by Carlyle Woodside Flores (2869); dam, Carlyle Larkspur (1994). Fourth in the yearling heifer class. Bred and owned by W. and D. Carr, Indooroopilly.

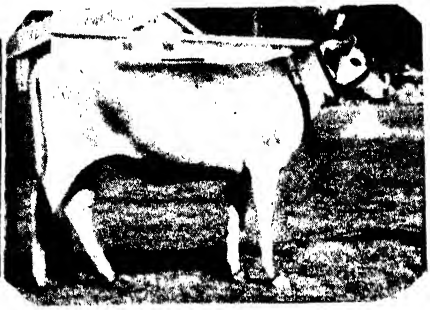
PLATE 114.



TRINITY MEADOWSWEET (7063), by Ginger Duke (1276); dam, Trinity Sunset (3845). Third in yearling heifer class. Bred and owned by J. Sinnamon, Goodna, Queensland.

BELLEVUE AILSA (8230), by Goldfinder (imp., 765); dam, Violet Angler of Bellevue (10881). A two-year-old heifer exhibited by Mr. W. E. O. Meiers, Rosevale, Rosewood.

PRIDE'S CRYSTAL OF BURNLEIGH (7810), by Trinity Darby (1720); dam, Sultane's Pride of Burnleigh (3135). Exhibited in yearling, in milk class, by W. W. Mallett, Nambour.



GLENVIEW HOLLY, by Carlyle Larkspur 2nd's Empire (1590); dam, Dolly 2nd of Sunnymeade (3263). Second for heifer, twelve and under eighteen months, dry. Bred and owned by F. P. Fowler and Son, Biggenden.

PINEVIEW JEWEL (8173), by Oxford Buttercup's Noble (2899); dam, Pineview Princess (4654). Bred and exhibited in the yearling, in milk, class by Messrs. J. Hunter and Sons, Borallon, Q.

OXFORD DIANTHUS (8506), by Oxford Renown (2257); dam, Oxford Daffodil (6497). First for heifer, 18 months and under two years, dry. Bred and owned by E. Burton and Sons, Wanora, Q.

PLATE 115.

CARNATION FAIRY FLY (6488), by Carnation Bright Star (2734); dam, Carnation Butterfly (3598). First prize heifer, two years old, in milk. Bred and owned by W. Spresser and Sons, Brassall, Ipswich.

PRINCESS OF ARRANMORE (7166), by Trinity Prince of Wales (2262); dam, Hope 969). Fourth for two-year-old heifer, dry. Bred and owned by A. S. Markwell, Beaudesert.

COLLEGE PRINCESS PONTIAC (1839), by Pabst Pontiac Blue Star (imp., 254349); dam, College Prima Donna (736). First and Champion Friesian cow (1929 and 1930), and first in Friesian butterfat with 80 lb. milk and 2.843 lb. fat in 24 hours. Owned by Hickey and Sons, Wilston.

INAVALE LADY 2nd, by Anama Dirkje's Pride (549); dam, Inavale Lady (2486). First prize Friesian two-year-old, dry. Bred and owned by C. Behrendorff, Boonah, Q.

ST. ATHAN ALMOND 3rd (3224), by Colossus of St. Athan (458); dam, St. Athan Almond (2304). First for Friesian cow, three years and under four, dry. Owned by D. Young and Sons, Kingaroy.

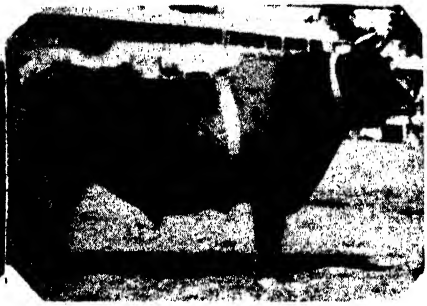
BURNBRAE GELSCHI FOBES, by St. Alban's North Star (1087); dam, Geneva of St. Athan (1267). Third in heifer, 18 months to two years, dry. Bred and owned by R. S. Alexander, Toogoolawah.

PLATE 116.

SHIELD 2nd of INAVALE (3125), by Duke of Brussels of Berry (63); dam, Shield of Inavale (229). First prize aged dry cow. Owned by D. Young and Sons, Kingaroy, Q.

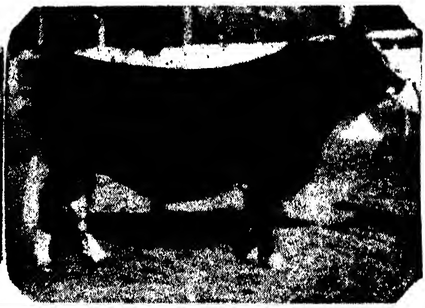
BONNIE WILLIE 2nd OF LONGLANDS (6874), by Longlands Bonnie Willie (6873); dam, Longlands Tina 5th (18542). First and Champion Ayrshire bull. Owned by J. H. and R. M. Anderson, Southbrook, Q.

FAIRVIEW LADY JEAN (17888), by Crescent Farm Beryl's Jock (6629); dam, Fairview Jean 2nd (17878). First for three-year-old, in milk, and Champion Ayrshire cow. Bred and owned by J. H. and R. M. Anderson, Southbrook, Q.



TRINITY DARBY (1720), by Lord Ettrey of Banyule (1277); dam, Fern's Crystal (imp., 1332). First and Champion for the third time at Brisbane. Owned by W. W. Mallett, Nambour, Q.

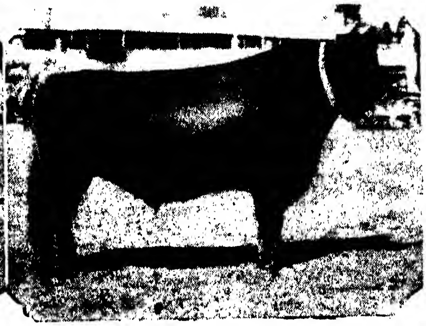
TRECARNE GOLDEN KING (3030), by Carnation Royal Scot (1890); dam, Trecarne Duchess (5266). First prize three-year-old and Reserve Champion Jersey bull. Bred and owned by T. A. Petherick, Lockyer.



TRINITY PRINCE OF WALES (2262), by Ginger Duke (1276); dam, Oxford Hazel (2120). Second in aged bull class. Owned by Mr. A. S. Markwell, Beaudesert.

PLATE 117.

WOODSIDE VASILIKA'S VOLUNTEER (3628), by Speedwell's Volunteer (imp., 3625); dam, Vasilika 7th of Woodside (20131). Second in three-year-old class. Owned by W. and D. Carr, Indooroopilly.



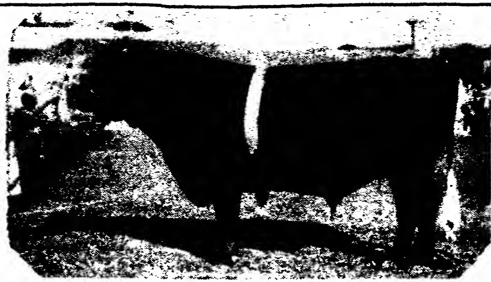
MONTROSE GIPSY OF GLEN IRIS (2227), by Montrose Sultan (imp., 2624); dam, Gipsy Love of Woodside (11257). Exhibited in aged class and sold by V. Goodger to R. J. Crawford, Inverlaw, Kingaroy, Q.

TRECARNE FERN LAD (3674), by Trecarne Sultan (2887); dam, Ginger's Fern of Brooklands (2470). Third in class for bull, two years old and under three years. Owned by W. H. Baulch, Forest Hill.

TRINITY OFFICER (1513), by Ginger Duke (1276); dam, Oxford Hazel (2120). Third in class for Jersey bull, four years old and over. Owned by F. P. Fowler and Sons, Biggenden, Q.

Plate 118.

DAPHNE'S ROYAL OF HILLVIEW (1129), by Gay Lad 2nd of Burradale (533); dam, Daphne 2nd of Hillview (3423). First and Champion A.I.S. bull. Owned by F. O. Hayter, Pomona, Q.



LIMELIGHT OF GULVALLIS (1254), by Royal Oak 3rd of Nestles (54); dam, Red Duchess 3rd of Nestles (901). Second and Reserve Champion A.I.S. bull. Owned by C. F. Francis, Merton Hall, Biarra, Q.

RENOWN OF MOUNTAIN HOME (1641), by Goldstream of Greyleigh (515); dam, Countess 4th of The Cedars (3872). First prize A.I.S. bull, two and under three years. Owned by J. A. Montgomery, Laidley, Q.

LORNA'S GENERAL OF ARLEY (271), by Cinderella's Recruit of Greyleigh (348); dam, Lorna of Arley (50). Fourth prize aged A.I.S. bull. Owned by A. C. Stewart, Wolvi, via Kin Kin.

LIMELIGHT OF RALEIGH (2120), by Royal Standard of Darbalara (2908); dam, Ethel 5th of Raleigh (13583). Second for A.I.S. bull, two and under three years. Owned by Messrs. Caswell and Franklin, Wangalpong, Q.

GUARDSMAN OF DARBALARA (1644), by Climax of Darbalara (899); dam, Melba 25th of Darbalara (10068). Purchased by Macfarlane Bros., Radford, from D. Dunn, Beaudesert, at 65 guineas.

PLATE 119.

YOUNG COMMODORE OF SPRINGDALE (1218), by Lovely's Commodore of Burradale (495); dam, Princess of Springdale (533). Head of winning sire's progeny stakes group. Owned by Hickey and Sons, Wilston.

MAJOR OF BLACKLANDS, by Red Prince of Blacklands (1064); dam, Jean 6th of Blacklands (239). First for A.I.S. bull, 18 months to two years. Bred and owned by A. Pickels, Blacklands, Wondai.

KIA-ORA OF SUNNYVIEW, by Jellicoe of Headlands (1315); dam, Scarlet of Forest Grove (12102). First prize A.I.S. bull calf, and sold by Mr. J. Phillips to Mr. B. C. Tuckett, of Brookfield, at the record price of 175 guineas.

HEADLIGHT OF FAIRFIELD, by Jellicoe of Fairfield (1136); dam, Linda 3rd of Fairfield (9420). Second prize A.I.S. bull, 18 months to two years old. Owned by V. Dunstan, Wolvi, Kin Kin, Q.

MIDGET SHIEK OF WESTBROOK (1511), by Shiek of Upton (934); dam, Midget of Westbrook (821). Fourth prize A.I.S. bull, two and under three years. Owned by Con. O'Sullivan, Greenmount.

JOHN BULL OF GREYLEIGH (1428), by Bosca of Greyleigh (205); dam, Linda 4th of Greyleigh (7999). Second prize A.I.S. bull three and under four years, and sold for 50 guineas by A. I. Titmarsh to W. A. Buchanan, Morayfield, Q.

PLATE 120.

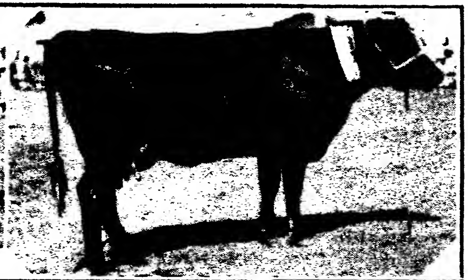
MYRTLE 4th OF LEMON GROVE (8042), by Dan of Greyleigh (97); dam, Myrtle 3rd of Lemon Grove (6489). First and Champion A.I.S. cow, and second in butterfat class with 73.1 lb. milk and 2.532 lb. fat in 24 hours. Owned by J. Phillips, Wondai, Q.

DIANA 11th OF KELSTON (8365), by First Warrior of The Cedars (279); dam, Diana 7th of Jinbiggaree (273). First in A.I.S. butterfat class with 67.5 lb. milk and 3.007 lb. fat in 24 hours. Owned by A. Frank, Boonah.

SUSIE 4th OF HILLFIELD (11895), by Robin of Brooklyn Terrace (1354); dam, Susie of Hillfield (8367). First A.I.S. cow, three and under four, in milk, and second in three-year-old butterfat class with 109.8 lb. milk and 4.3480 lb. fat in 48 hours. Owned by S. J. Lester, Laidley.

POLLY 5th OF SPRINGDALE (2986), by Plum's Boy of Greyleigh (480); dam, Polly 4th of Springdale (3414). Second in aged dry A.I.S. cow class. Owned by V. Dunstan, Wolvi, Q.

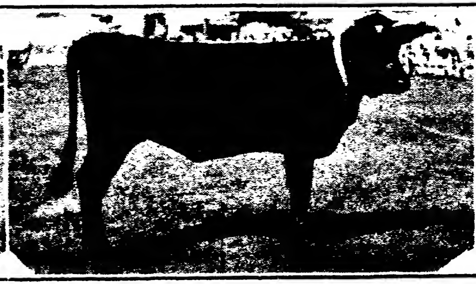
DAHLIA 7th OF SPRINGDALE, by Emperor of Springdale (811); dam, Dahlia 3rd of Springdale (853). Second A.I.S. heifer, two and under three, dry. Owned by A. J. Caswell, Wangalpong, Q.



DIANA 17th OF KELSTON (14244), by First Warrior of The Cedars (279); dam, Diana 7th of Jinbiggaree (273). Fifth prize A.I.S. three-year-old, and present holder of Australian two-year-old production record. Owned by A. Frank, Boonah.

PLATE 121.

QUEENIE 3rd OF GLENDALOUGH, by Don of Springdale (971); dam, Queenie 3rd of Pine View (2199). First A.I.S. heifer, 18 months to two years, in milk. Bred and owned by Hickey and Sons, Wilston.



DNALWON LUCKY STAR, by Limelight of Raleigh (2120); dam, Whinflower's Lucky of Dnalwon (5136). First A.I.S. heifer calf under 12 months. Bred and owned by A. J. Caswell, Wangalpong.

RUBY OF CORUNNA (5070), by Victor 2nd of Balmoral (237); dam, Champion 2nd of Corunna. Fifth A.I.S. cow, five years and over, in milk. Owned by Mrs. J. Handley, Murphy's Creek, Q.

MODESTY 2nd OF SUNNYMEADE, by Masterpiece of Oakdale; dam, Modesty 3rd of Dunmore. First prize A.I.S. cow, five years and over, dry. Bred and owned by Cowen Keys, Wondai.

TILLY 8th OF CEDAR GROVE, by Charmer of Cedar Grove; dam, Tilly of Cedar Grove (4240). First prize A.I.S. cow, three and under four, dry. Owned by Guppy Bros., Esk, Q.

STELLA OF BLACKLANDS, by Sultan of Blacklands (775); dam, Lady Primrose of Blacklands (7446). First A.I.S. heifer, two and under three, in milk, and third in heifer butterfat class with 102.3 lb. milk and 3.4334 lb. fat in 48 hours. Bred and owned by A. Pickels, Wondai.

PLATE 122.

Mr. Ben. O'Connor's fine pen of A.I.S. cows shown in the class for group of cows, three years old and over. On the extreme left is Rosette of Wilga Vale, champion butter-fat cow of Queensland.

Three of the females exhibited at the Brisbane Royal by Mr. V. Dunstan, of Wolvi, via Kin Kin. Although a comparatively new exhibitor at Brisbane, Mr. Dunstan was well among the ribbons with his fine team.

The preliminary line-up of the aged, in milk, class for A.I.S. On the extreme right is Rosette of Wilga Vale, one of the first cows stood up by Mr. Wills. The ultimate winner of the championship, Mr. J. Phillips' Myrtle 4th of Lemon Grove is third from the right, and in between the two of them is Mr. A. Pickels' Jean 6th of Blacklands.

PLATE 123.

Messrs. Hickey and Sons, of Wilston, Brisbane, put up a great display of Friesian and A.I.S. at the Brisbane Royal and took away their biggest collection of ribbons to date. On the left is Young Commodore of Springdale and two heifers which won the blue in the Sire's Progeny Stakes group, and on the right is the big group which won for them the Friesian Exhibitor's Group.

Plate 124.

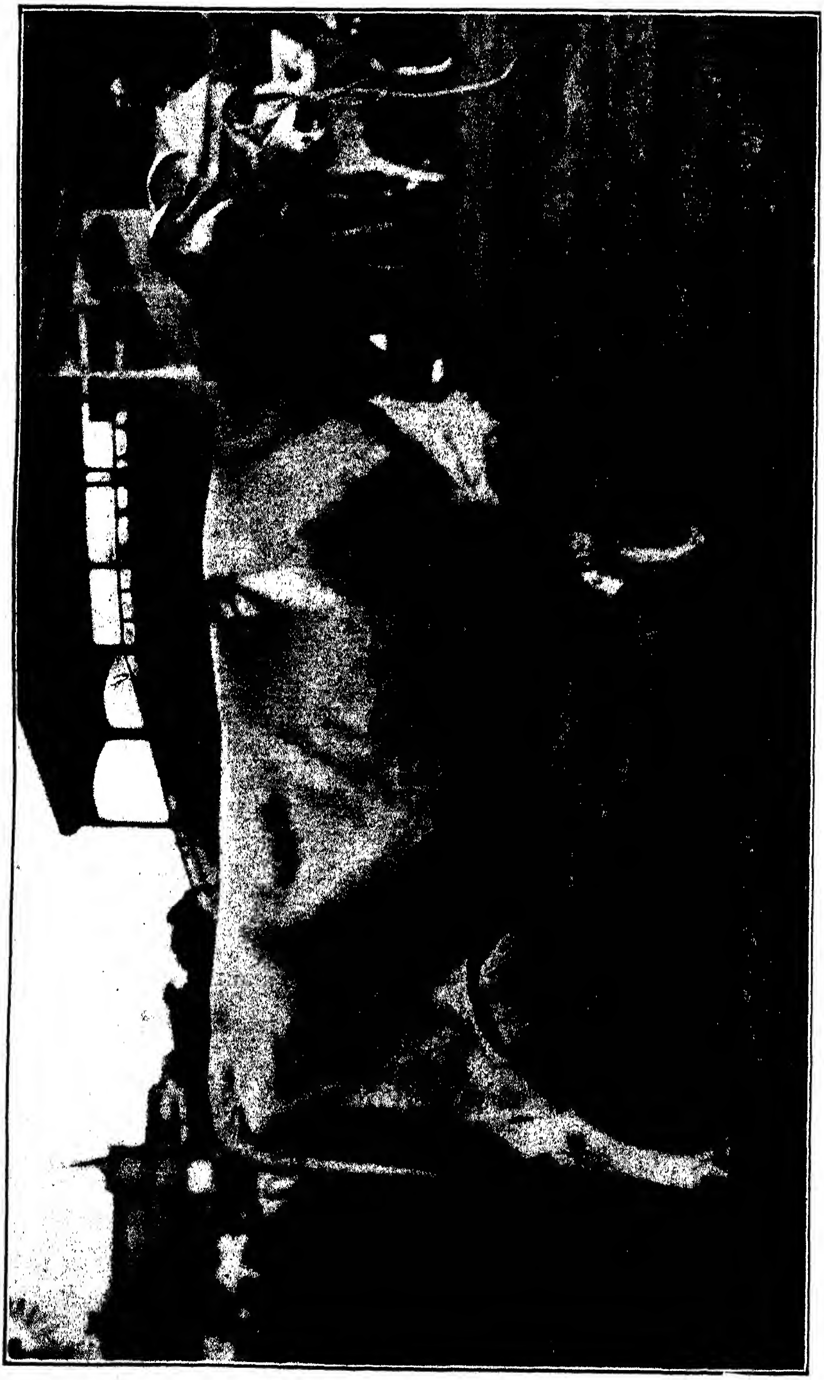


Plate 125.—"Oxford Golden Buttercup" (Burton & Sons) Champion Jersey Cow, Brisbane Show, 1930.

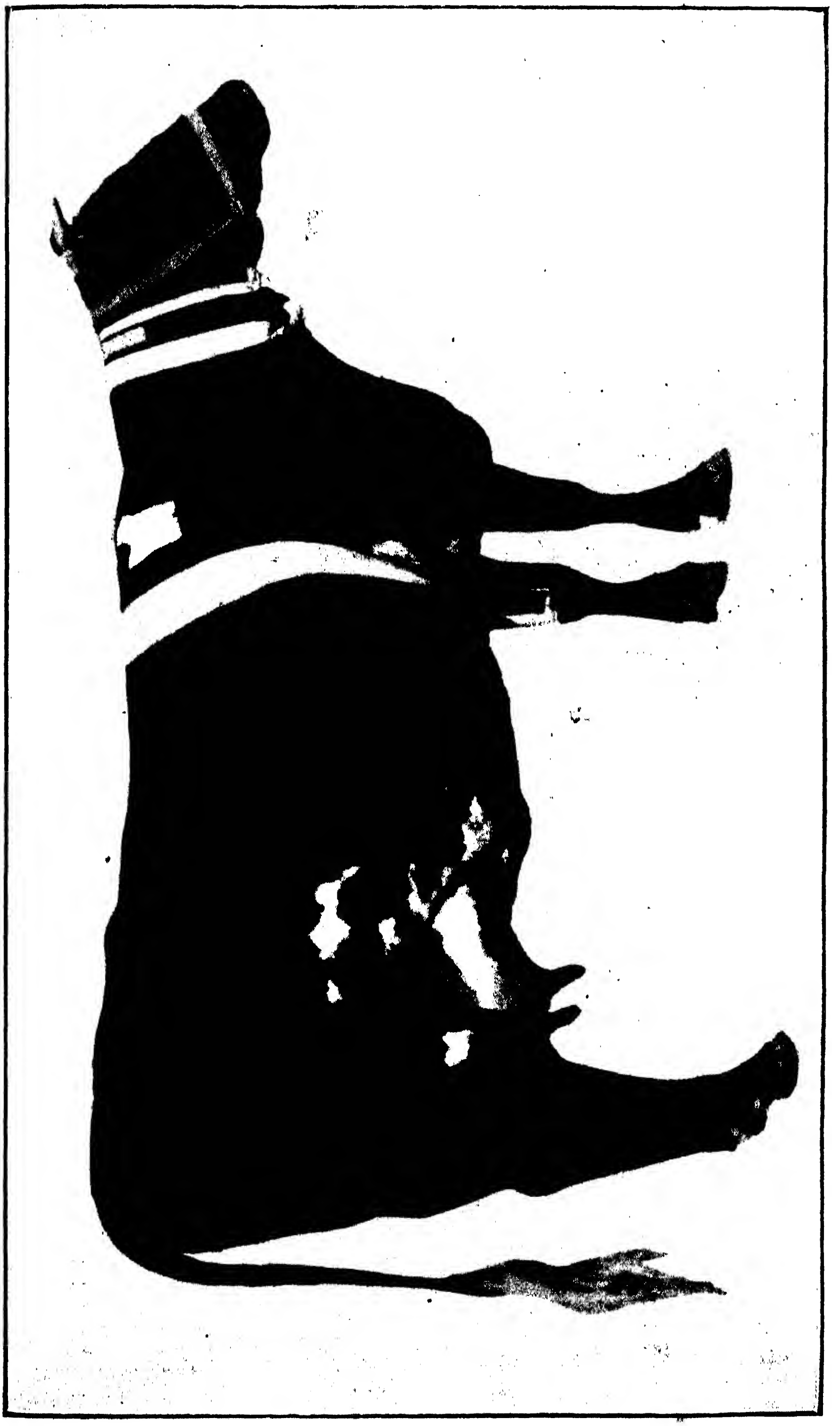


Plate 126.—B. O'Connor's "Rosette of Wilga Vale," Champion Butter Fat Test Cow, Royal National Association Show, Brisbane, 1930.

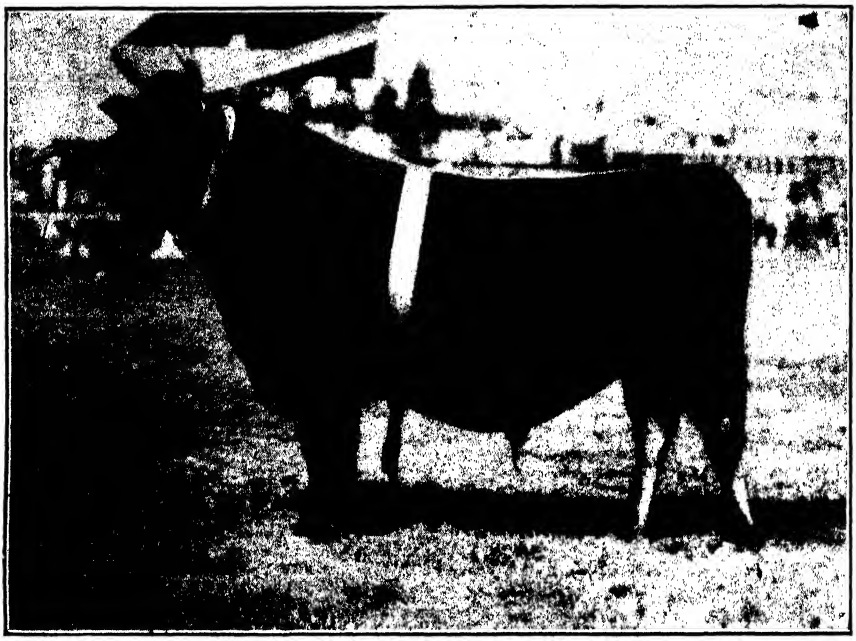


PLATE 127.—TRINITY DARBY, CHAMPION JERSEY BULL. BRISBANE SHOW, 1930.

GROUND MILKING COMPETITION.

In the results of the Ground Milking Competition published in the September Journal, on page 293, the figures published of "Fussy 5th of Railway View" were incomplete. The complete official figures are as follows:—

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
	Lb.	Per cent.	Lb.			
A. T. Waters' Fussy V. of Railway View (A.I.S.)—						
Night	23·2	3·5	·812	..	..	..
Morning	24·6	3·4	·8364	..	..	..
Noon	21·0	5·1	1·071	..	..	..
Night	21·3	3·5	.7455	..	..	..
Morning	25·1	3·5	·8785	..	..	..
Noon	18·3	4·4	·8052	..	..	..
Total, 48 hours; average, 24 hours	133·5	..	5·1486 2·5743	.. 41·19	.. 4·9	.. 46·09

THE ANGORA RABBIT.

Compiled by J. W. MUNRO, Department of Agriculture and Stock.

ANYONE intending to engage in fur and wool producing rabbit farming must bear in mind the conditions incidental to the issue of a license. Every keeper of rabbits must be licensed. Before a license will be issued enclosures must be erected, within which all rabbits must be maintained in accordance with the specifications as set down by the Department of Agriculture and Stock. Modifications of these specifications may be allowed where it is established that the materials necessary are unprocurable in the locality where the enclosures are to be erected; but in each instance the sanction of the Department must be first obtained. The license fees vary according to the number of rabbits to be kept, and the fees stipulated in the regulations cover the cost of inspection of the enclosures. Where negligence has been proved, and more than one inspection is necessary to ensure compliance with the official requirements, the extra cost involved in such additional inspections must be borne by the applicant. When the enclosures have been erected, an application, together with the necessary fee, should be lodged with the Department. An inspection will follow, and if the enclosures have been constructed to the satisfaction of the inspector a license will be issued.

Licensees must in each year, not later than the second week in January, make application for a renewal of their license, unless in the meantime they have, with the sanction of the Department, disposed of their rabbits.

Under no circumstances whatsoever must a rabbit be removed from an enclosure, either by way of gift or sale, without first obtaining the permission of the Department. Should a holder of these animals desire to sell any of the produce (stock) he must first make application for a dealer's license, the fee for which is £1 per annum or such other sum as may from time to time be declared by the Department.

Before a dealer delivers a rabbit to a prospective purchaser, he should impress upon the purchaser that he must erect the necessary enclosures and present his license to keep rabbits. Every sale effected must be immediately reported to the Department by the dealer.

Any contravention of the regulations renders the person or persons committing such breach liable to a penalty of £10.

Specifications and approved plans of suitable enclosures are appended.

Foundation of Hutchery.

Prospective purchasers should procure the very best stock obtainable for the foundation of their hutcheries.

Only recognised studs should be approached. Beware of speculators. The industry has suffered in other countries through speculators demanding exorbitant prices for inferior animals, and persons entering the industry with the erroneous assumption that a first-grade wool can be produced from such stock. By first consulting officers of the Department before purchasing, a good deal of trouble and worry may be obviated.

Housing.

By the time the rabbits are available for delivery, hygienic conditions should have been provided for their confinement. The hutches should be so constructed as to provide for easy removal of the droppings. The floor should be of ½-inch mesh netting wire stretched in such a way as to prevent sagging. Provision should be made immediately under the netting floor for a galvanised iron tray, easily removable for cleansing purposes. Wooden floors are out of the question, for they cannot be sufficiently cleansed to obviate unhealthy and objectionable odours.

Racks should be provided in the hutches for the holding of the greenstuffs, as well as a small box for the grain supply.

The construction of the hutch must permit of locking to ensure security of confinement of the animals.

As rabbits are purely hutch animals, the hutch is its home, and consequently hygienic conditions and comfort should be provided. Each hutch or compartment should be not less than 3 feet x 2 feet x 2 feet, and should be rat and mouse proof.

Feeding.

Rabbits are by nature vegetarians, consequently it must be remembered that their natural food is greenstuffs. If there is an abundance of this available it can be fed with safety in large quantities, thereby saving in the cost of grain. This is

an important factor in successful wool production for profit. Rabbits enjoy almost any green foods, and no other food compares with it for the development of the stock. The greenstuffs most relished by rabbits are thistle, lucerne, clover, chicory, pea vines, occasional sweet potatoe vines, and any grass that cattle will eat.

Hay being a bone-forming food should be available at all times, especially in the case of growing animals. Dry crusts of bread are invaluable to the breeding doe. During the winter months care should be exercised in seeing that frosted foods are not provided, thereby avoiding a considerable amount of trouble. In wet weather do not feed wet greenstuff, but lay it aside for drying without allowing it to become heated. In feeding, it is considered advisable to vary the class of feed supplied at each meal, thereby permitting the rabbit to balance its own ration. Roots suitable for winter feeding are artichokes in conjunction with hay, carrots, kohl rabbi, turnips, swede turnips, or an occasional beetroot.

The use of iodine is highly recommended and should be made up as follows:—Dissolve half an ounce of iodide of potassium in one and a-half pints of water. One teaspoon to a gallon of water is the recognised dose, or the same proportion in the water used to mix mash when mashes are fed to the animals. Iodine greatly improves the wool yield and is a deterrent to all forms of rabbit ailments.

A small handful of rolled oats is an excellent substitute for grain. The grains most suitable as a feed are crushed oats, rolled oats, flaked maize, dried brewer's grains, bran, and a few peas occasionally. A piece of rock salt should always be available as a lick. A plentiful supply of fresh drinking water should also be available.

Mating the Does.

Always place the doe in the buck's hutch—it is inadvisable to remove the buck from his own hutch for the purpose of mating. When the doe is ready for mating she generally lets you know by plucking herself and making a nest. Should the buck chase the doe around the hutch it is a certain indication that the doe is not in season and should be returned to her hutch until she is ready. A proper service is recognised by the doe raising her hindquarters and the buck falling over on his side. Watch for this, for if it does not happen it is sufficient proof that the doe is not in kindle. After the mating has been successful, the doe should be replaced in her hutch and left undisturbed.

Breeding.

Rabbits should never be mated until eight to nine months old, preferably at the latter age, when they have reached maturity. The gestation period is approximately thirty days. The actions of the doe vary according to temperament when the time for kindling arrives. Some does will prepare their nest two or three days before they are due, others perhaps only an hour or two. She should be assisted in her nest-building by making available ample supplies of soft hay. Should the doe fail to pluck herself, and kindle down with only the hay nest, cotton wool should be provided and a nest made for her. When the young arrive the nest should be examined, and if any stillborn or dead are found they should be removed immediately, otherwise the doe will eat them, and the probability is that she will kill the rest of her family and eat them also. On examining the nest it should be done very gently so as to avoid exciting the doe. Another point to be considered is in seeing that the doe is not overfat when kindling. For some unknown reason, in such cases the doe has eaten her young and left no trace behind her. The young when born are naked, blind, and deaf, and warmth is provided by the doe, who plucks herself and covers the young with her own wool. Ample supplies of water and green foods should be provided for the doe at this stage. The number in a litter varies, but a fair average is six. When this number is exceeded the surplus should be taken away, for it is generally considered that a doe can only satisfactorily nourish that number. Four litters per year are possible, but three is the number preferred by breeders who desire to give the doe every consideration. Avoid handling the kittens wherever possible.

Weaning.

At the age of five weeks the young are able to fend for themselves, and at this stage ample supplies of fresh green food should be available. During the first five weeks following birth they should be allowed to remain undisturbed with the doe. For the next three days the young should be separated from the doe for a period of two hours daily. For the following three days they should be removed from the doe during the whole of the day and only placed back with her at night. At this

stage they should be weaned and a definite separation effected. At the end of a further week, if the doe's condition is considered satisfactory, she may be again placed with the buck.

Diseases.

The provision of hygienic conditions in the maintenance of rabbits reduces to a minimum the possibility of contraction of disease. Cleanliness in feeding a variety of foods at regular intervals is essential to the health of the animals. Provide scope for as much exercise as the rabbit cares to take. Abundant supplies of drinking water should always be available.

Snuffles.—A serious and highly infectious cold, with sneezing and an offensive discharge from the nostrils. Isolate and disinfect the suffering animals. If not a valuable animal it should be destroyed. Oil of eucalyptus is sometimes beneficial, but it is only in rare cases that a cure can be effected.

Coccidiosis.—This is the worst disease known to affect young stock. It is highly infectious, and the source of infection is the droppings and dirty floors. It causes a very severe form of diarrhœa and plays havoc in the hutchery. Destroy all but valuable animals that become affected. Thoroughly disinfect the hutch from top to bottom with boiling water and carbolic acid. The parasite (coccidia) must be outside the host for a period of five days before reinfection can take place. Hutches should therefore be disinfected at intervals of five days.

Diarrhœa.—For this ailment, change the diet. If green food has been provided substitute it for hay and mash or boiled rice and milk. If green food has not been provided, do so. Charcoal often affords relief, and in most cases bread and milk is very helpful.

Constipation.—Lack of vivacity and loss of appetite are certain indications of this ailment. Vary the food and add a small quantity, say half an ounce, of cod liver oil to the mash. A teaspoon of castor oil will produce results.

Mange.—This is recognised by bare patches and scabs on the nose, lips, forehead, ears, and legs. Smear affected parts daily with equal parts of benzine and olive oil for a period of ten days. The result should be satisfactory.

Vaginal Catarrh.—In this ailment the vagina is swollen, showing a watery discharge. Thoroughly bathe the parts with a half per cent. solution of alum and water until trouble disappears.

Vent Disease.—This is discernible by inflammation and sores. Bathe with 2 to 3 per cent. lysol; wash daily and, after drying, smear with carbolised vaseline.

Sore Mouth.—This is generally the result of overgrown teeth. Place a fair-sized piece of wood in the hutch for the rabbit to nibble; this should remove the trouble. Pay particular attention to the mouth, as wool is apt to gather and mat around the teeth. When this occurs an extreme soreness of the mouth is created, and the resultant loss of appetite seriously impairs the condition of the animal.

Sore Eyes.—This ailment is generally caused by vapour of urine, which should be located and precaution taken against its possibility of remaining in the hutch on any future occasion. Dissolve boracic acid in water and drop into the eyes at frequent intervals during the day and wipe dry.

Sore Feet.—Sore feet are caused by rough or dirty floors. Supply soft hay for resting on, when the trouble will eventually disappear.

Grooming.

Where rabbits are satisfactorily housed grooming will be only necessary periodically, but where several animals are hutched together repeated grooming is essential to obviate matting of the wool. A long sharp-toothed comb is the best utensil, but care should be exercised in seeing that the skin is not lacerated whilst grooming. Any wool that is removed in grooming should not be destroyed, for in many cases it is of the best grade.

Shearing.

Round-pointed scissors are recommended for shearing, and where care has been exercised in grooming there should be no possibility of injury. This work should commence along the back, starting from the tail and shearing approximately a half inch from the body as far as the head. Proceed along the sides, but never remove the wool from the belly, breast, or legs in the case of breeding does. Avoid unnecessary crossing of the fibres when storing, and see that all particles of foodstuffs and hay are removed. For manufacturing purposes wool of 3-inch to 4-inch staple is best. Shorter lengths should be removed and kept separate. Plucking,

though satisfactory, is a much longer operation and does not increase the value of the wool. Grooming should be done immediately after shearing, as it is helpful in enabling the new growth to emerge. A first-class Angora is capable of producing 10 to 12 ounces of wool per annum. Never shear until the wool is at least 3½ inches long.

Features of the Angora.

Size and shape.—Round (snowball effect), not under 6 lb. in weight.

Front.—Full and prominent.

Head.—Short, broad at forehead, well tufted, with noble appearance. Wedge-shaped head with long ears signifies lack of type and should be discarded.

Ears.—Short and tufted.

Eyes.—Pink, with no discolouration of the whites.

Legs.—Straight with long furnishings of wool.

Condition.—Clean, healthy, and well groomed.

Wool.—Texture as silky as possible, evenly thick all over, and contour wavy. Straight, coarse wool of hair-like appearance should not show on good class stock. Such wool will not be accepted by manufacturers, notwithstanding any statement made to the contrary by salesmen.

APPENDICES.

1.—SPECIFICATIONS.

Specification "A."

The outer rabbit-proof enclosure shall consist of 60-inch rabbit-proof netting (6 inches in the ground and 4 feet 6 inches above the ground), the netting to be No. 17 gauge, 1¼-inch mesh, and to be attached to three plain galvanised No. 10 wires, one 18 inches, one 3 feet, and one 4 feet 6 inches above the ground respectively.

Two barbed wires to be provided, the first 3 inches above the netting and the second 3 inches above the first.

Sketches showing construction of enclosures as laid down in conditions governing the keeping of Angora, Chinchilla, and other approved types of hutch fur-bearing rabbits for the purposes of fur farming.

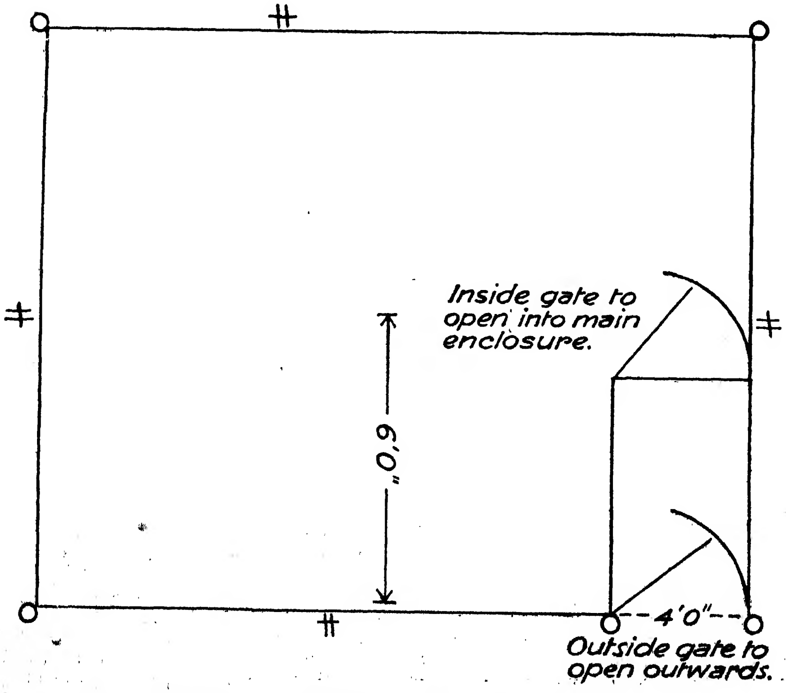


PLATE 128 (Fig. 1).—WHEN RABBITS ARE KEPT IN HUTCHES

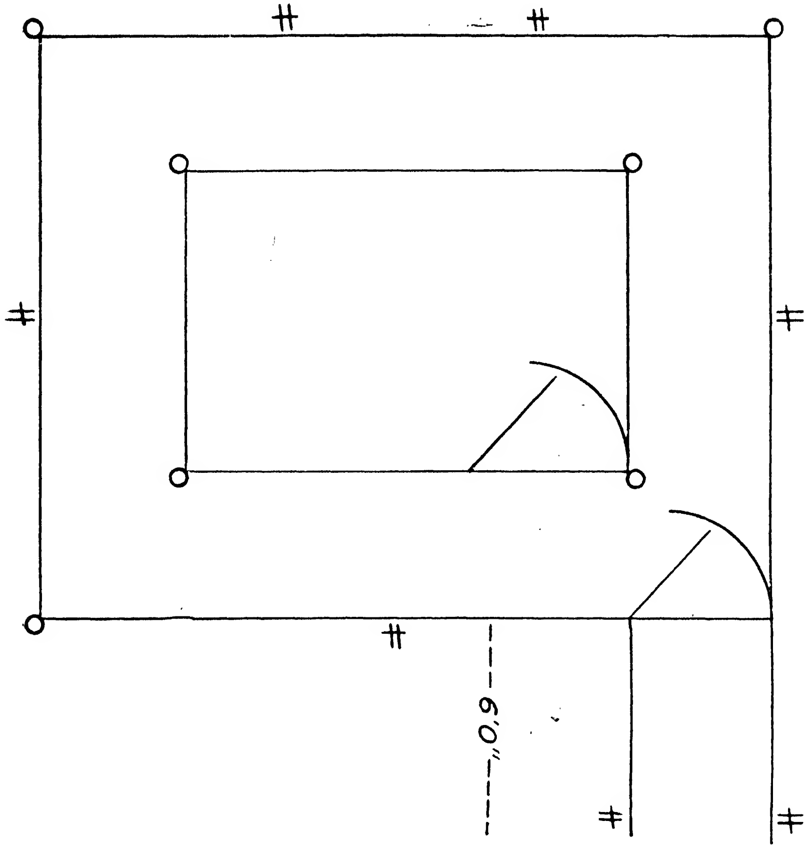


Plate 129 (Fig. 2).—When Rabbits are not kept in Hutches or only partly in Hutches.

Note.—Although the enclosed yard, 6 feet x 4 feet, is shown in Fig. 1 within the large enclosure to save material, it may be erected outside the large enclosure, as shown in Fig. 2, if the owner so desires, in either case. In Fig. 2 the distance between the fence of the outside enclosure and the inside enclosure is not to be taken as drawn to scale—that is to say, the distance between the two fences is a matter for decision by the owner.

The netting to be affixed to the inside of the posts, and any struts or other supports to be placed on the exterior of the enclosure.

Fencing posts to be of hardwood 7 feet 6 inches long (2 feet in the ground and 5 feet 6 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used. Strainer and corner posts to be 8 feet 6 inches long (3 feet in the ground and 5 feet 6 inches above the ground) and to measure 7 inches in diameter at the small end.

At the entrance to the enclosure an enclosed yard 6 feet long by 4 feet wide to be constructed either within or without the enclosure, the fencing for this purpose to consist of 60-inch rabbit-proof netting, No. 17 gauge, 1¼-inch mesh, 6 inches in the ground and 4 feet 6 inches above the ground, affixed to three No. 10 plain galvanised wires; one plain wire to be fixed 9 inches above the top of the wire-netting.

The posts to be erected within the main enclosure for supporting this fence to be of hardwood 7 feet 6 inches long(2 feet in the ground and 5 feet 6 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of

sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used.

In addition to the entrance gate into the enclosure another gate shall be constructed in the yard. Each gate shall be covered with rabbit-proof netting and to be fitted with strong springs to ensure that they shall be kept closed, or be so constructed as will prevent more than one gate being open at the same time. The inner gate to open inwards into the closure and the outer gate to open outwards.

Specification "B."

The inner enclosure shall consist of 42-inch rabbit-proof wire-netting (6 inches in the ground and 3 feet above ground), such netting to be No. 17 gauge, 1¼-inch mesh, and to be affixed to two No. 10 plain galvanised wires (one 18 inches above the ground and the other 3 feet about the ground), one plain wire to be fixed 9 inches above the top of the wire-netting.

The fencing posts for the inner enclosure shall be of hardwood 5 feet 9 inches long (2 feet in the ground and 3 feet 9 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used.

A gate opening inwards may be provided.

2.—REGULATIONS.

REGULATIONS UNDER "THE ANIMALS AND BIRDS ACTS, 1921 TO 1924."

Department of Agriculture and Stock,
Brisbane, 23rd January, 1930.

THE Deputy Governor, acting for and on behalf of His Excellency the Governor, and by and with the advice of the Executive Council, has, in pursuance of "*The Animals and Birds Acts*, 1921 *to* 1924," been pleased to amend Regulation 50 of the abovementioned Acts, and to make the following additional Regulations.

W. H. BARNES.

Part I.

Amendment of Regulation.

Regulation 50 is hereby amended by the addition, after the word "Rabbit" in the Schedule thereto, of the words "other than the Angora Rabbit, Chinchilla Rabbit, or other approved hutch fur-bearing rabbit."

Part III.

Licenses to keep fur-bearing rabbits.

51. Every person who desires to keep Angora rabbits, Chinchilla rabbits, or any approved fur-bearing rabbits shall make application to the Under Secretary for a license, accompanied by the prescribed fee payable in that behalf. The Under Secretary may, at his discretion, grant a license to the applicant in accordance with Form P hereto. Licenses shall not be transferable, and shall be applicable only to the area specifically mentioned therein, and may be withdrawn and cancelled at any time without notice. The number of rabbits specified in the license shall not be exceeded.

Maintenance in enclosures.

52. Such rabbits shall at all times be maintained by such licensee within a rabbit-proof enclosure, constructed to the satisfaction of the Minister or any officer authorised by him, and no rabbit shall be removed by the licensee or any other person or persons from a licensee's holding, or by him or them permitted to escape therefrom, except under a permit issued by the Under Secretary. The Minister or any other officer authorised by him shall have the right of inspection at any time.

53. In the event of failure to renew or withdrawal or cancellation of the license, all rabbits in respect of which the license is issued shall be destroyed by the licensee, or in default of him by any person authorised by the Minister, who shall have power for that purpose to enter upon premises to which such license applies, or the premises where such rabbits may be held for the time being.

Inspection and license fees.

54. The following fees shall be payable:—

	Per Annum. £ s. d.
For license to keep up to 25 rabbits	0 10 0
For license to keep from 26 to 50 rabbits	0 15 0
For license to keep from 51 to 100 rabbits	1 0 0
For license to keep from 101 to 200 rabbits	1 10 0
For license to keep from 201 to 400 rabbits	2 0 0
For license to keep each additional 100 or portion thereof	0 10 0

The above fees cover inspection and license fees, but where the requisite structures have not been erected in accordance with the conditions mentioned, and a further inspection is subsequently necessary, the applicant will be required to pay the extra expense involved before a license will be issued. Licenses will expire on 31st December in each year.

Limitation of licenses.

55. Licenses will only be issued for rabbits to be kept in the following pastoral districts:—

Darling Downs, Moreton, Wide Bay, Burnett, Port Curtis, South Kennedy east of 148th meridian, North Kennedy, that portion of Cook comprising the Petty Sessions districts of Atherton, Cairns, Innisfail, and Herberton.

Penalty.

56. Any person committing a breach of these Regulations shall be liable to a penalty of fifty pounds.

[Form P.]

"The Animals and Birds Acts, 1921 to 1924."

LICENSE.

To Keep Approved Fur-bearing Rabbits.

Subject to the conditions hereinafter specified, , of , is hereby licensed under the abovementioned Acts to keep rabbits at for the period beginning the day of , 19 , and ending the thirty-first day of December, 19 .

Conditions.

1. That the number of rabbits kept shall not exceed the number for which this license is granted.

2. That the rabbits shall be kept in an enclosure constructed in accordance with specification prescribed by the Under Secretary.

3. That the enclosure shall be kept padlocked during the night and during the absence of supervision.

4. That the rabbits shall be kept in hutches within the enclosure or in an inner enclosure constructed in accordance with specification prescribed by the Under Secretary.

5. The hutches shall be provided with doors, which shall be kept padlocked.

6. That the rabbits and the enclosures and hutches in which they are kept may at all times be inspected by any officer authorised for that purpose by the Minister of Agriculture.

7. That the carcasses of all rabbits that die from disease, and all excreta, shall be destroyed by fire.

8. That the rabbits shall not be kept at any place other than the address above stated.

9. That the rabbits shall not be removed or permitted to escape from the above-stated address unless a permit for the removal has been issued by the Under Secretary, Department of Agriculture and Stock, Brisbane.

10. That this license is not transferable, and may be cancelled by the Minister of Agriculture at any time without prior notice to the holder thereof.

Given under my hand, at Brisbane, Queensland, this day of , 19 .

Under Secretary for Agriculture and Stock.

CLIMATOLOGICAL TABLE—AUGUST, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·06	80	64	85	26	54	2, 3	14	1
Herberton	..	73	48	79	8, 9, 26	34	15	5	1
Rockhampton	30·12	77	53	84	21	40	13	141	5
Brisbane	30·11	72	51	82	30	42	14	176	8
Darling Downs.									
Dalby	30·14	69	42	78	29	29	16	250	5
Stanthorpe	..	61	36	72	29	22	13,16	249	12
Toowoomba	..	63	42	76	29	27	16	173	6
Mid-interior.									
Georgetown	30·04	85	54	93	20	39	14	66	2
Longreach	30·10	79	47	92	29	36	4	0	0
Mitchell	30·13	70	39	87	29	26	13	132	4
Western.									
Burketown	30·05	84	58	91	19	48	5	9	1
Boulia	30·09	79	47	93	29,30	39	5	0	0
Thargomindah	30·10	70	46	85	29	37	4,12	34	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING AUGUST, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Aug.	No. of Years' Records.	Total Rainfall. Aug. 1930.	Aug. 1929.	Divisions and Stations.	Average Rainfall. Aug.	No. of Years' Records.	Total Rainfall. Aug. 1930.	Aug. 1929.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	0·82	29	0·05	0·26	Nambour	1·86	34	2·15	1·07
Cairns	1·72	48	0·97	0·84	Nanango	1·36	48	1·19	1·32
Cardwell	1·28	58	0·20	0·24	Rockhampton ..	0·96	43	1·41	0·05
Cooktown	1·28	54	0·14	0·43	Woodford	1·73	43	1·77	1·06
Herberton	0·63	43	0·05	0·06					
Ingham	1·48	38	0·18	0·47					
Innisfail	5·03	49	1·93	1·85					
Mossman	1·23	17	0·89	0·33	*Darling Downs.*				
Townsville	0·52	59	0·05	0					
					Dalby	1·21	60	2·50	0·29
					Emu Vale	1·17	34	1·36	0·77
Central Coast.					Jimbour	1·20	42	1·38	0·64
					Miles	1·15	45	1·54	0·44
Ayr	0·59	43	0·11	0	Stanthorpe	1·81	57	2.49	1·13
Bowen	0·67	59	0	0·27	Toowoomba ..	1·69	58	1·73	0·69
Charters Towers ..	0·57	48	0	0	Warwick	1·51	65	1·13	0·68
Mackay	1·06	59	0·89	0·19					
Proserpine	1·36	27	0·30	0·74					
St. Lawrence.. ..	0·86	59	0·13	0	*Maranoa.*				
					Roma	0·96	56	0·81	0·21
South Coast.									
Biggenden	1·08	31	1·87	1·42					
Bundaberg	1·28	47	2·64	0·39	*State Farms, &c.*				
Brisbane .. .	2·05	79	1·76	0·95					
Caboolture	1·55	43	2·59	1·00	Bungeworgorai ..	0·86	16	0.53	0·19
Childers	1·22	35	2·28	0·82	Gatton College ..	1·18	31	0.92	1 02
Crohamhurst ..	2·19	37	2·96	1·25	Gindie	0·69	31	0	0·15
Esk	1·54	43	1·65	1·43	Hermitage	1·29	24	1·63	0 55
Gayndah	1·17	59	1·79	0·69	Kairi	0·89	16	0	..
Gympie	1·75	60	1·93	1·21					
Kilkivan	1·46	51	3·00	1·80	Mackay Sugar Experiment Station ..	0·94	33	0·60	0 24
Maryborough ..	1·66	58	3·43	0·70	Warren	0·85	15	..	0

GEORGE. G BOND, Divisonal Meteorologist.

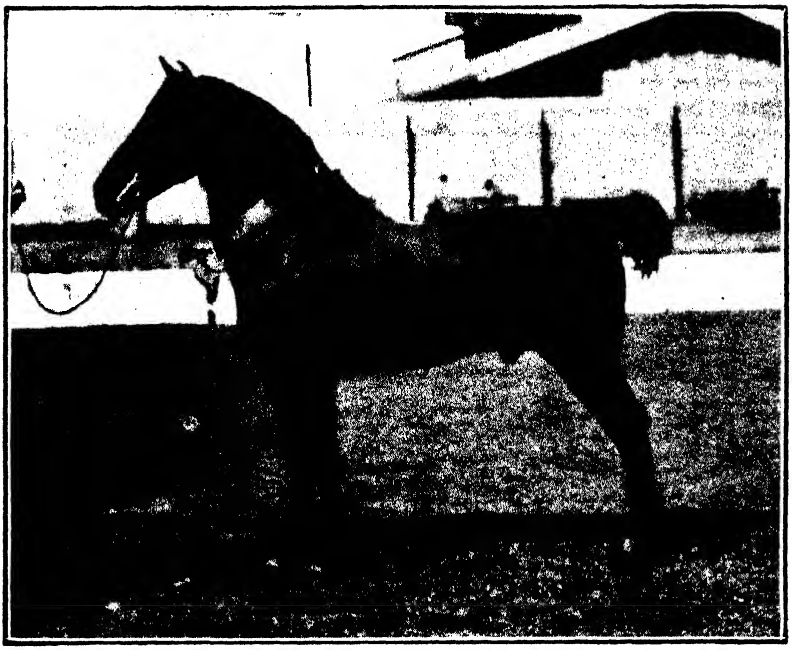


Plate 130.—Mr. J. A Rudd's "Hafrod Sensation," Champion Harness Pony, Brisbane Show, 1930.

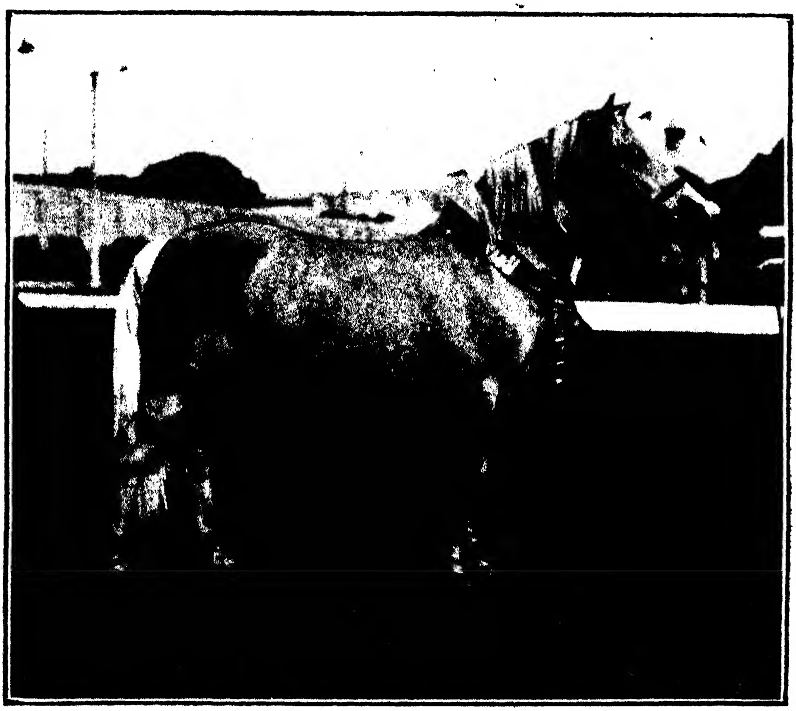


Plate 131.—"Byrons Pride," Champion Saddle Pony Stallion, Brisbane Show, 1930—the Property of Mr. W. T. Mulroney.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART I.

This is the first article of a series planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising on comparatively small holdings

SHEEP COUNTRY IN QUEENSLAND.

WITH an area of over 430,000,000 acres, it is impossible to lay down any hard-and-fast rule in connection with sheep farming in Queensland, but still there are certain areas where both soil and climate are deciding factors in favour of this branch of animal husbandry.

The merino is the dominant breed in Queensland, and it may be regarded as the most suitable throughout the central and western portions of the State; whether they are serving the best purpose over the remainder of our territory has still to be decided.

The area embracing the country from the South Australian border, along the New South Wales border to Goondiwindi, thence westward to Camooweal may be described as being suitable to the merino. Some local influences hamper sheep farming in parts of this area, chiefly lack of sufficient improvements and the dingo pest.

In this division there are distinct areas suitable for cultivation, but on account of its more or less restricted rainfall it is mostly grazing country. Cultivation would mean the destruction of native pastures to the extent to which it is practised. With no certainty of sufficient rain during a crop-growing period, the wisdom of cultivation for fodder would be open to question.

The Treeless Plains.

In this western area there are wide variations of both soil and vegetation. Large stretches of country carry grass, but no trees or shrubs. Mitchell and Flinders are the two chief indigenous grasses on these areas; both make good sheep feed, and during the greater period of their growth are suitable for fattening and for wool-growing. In normal to good years the carrying capacity of this country is high, but in the summer the want of shade is seriously felt. This is intensified in dry years when the sun and wind have full play on the open plains.

Comparatively small areas in this class of country cannot be regarded as suitable for breeding purposes, but the type of wether most suitable for producing wool can be conveniently secured by the new settler. The systematic planting of shade trees would alter existing conditions considerably; and the erection of shelter sheds, especially near the watering-places, could well be brought within the scope of good management.

The Rolling Downs.

The downs country, interspersed with trees and shrubs, is ideal sheep country, with usually a good covering of Mitchell and other grasses; and in many places edible herbage, including some varieties of salt bush. Many of the shrubs and trees are also edible, making a good standby in times of drought. It is in this class of country that sheep breeding can be carried on most successfully. The strong-wooled type of merino has been found to be most suitable for the conditions, and from these areas large numbers of breeding ewes are distributed to areas less suitable for breeding purposes, while wethers, chiefly, form the wool-producing flocks on the treeless plains. The great work of the old pioneers in these western areas in establishing flocks successfully under difficult conditions redounds to their credit; but the chief factor in later success was the raising of the standard of the breed to a type best fitted to withstand hard conditions and still give a greater weight of wool.

Western Queensland merinos are singularly healthy, so that, notwithstanding the ravages of the dingo, blowfly, and drought, we still look to the western country to keep the breed intact. The runs in this area are to a great extent fairly large, but changes are looming high, and many of the large leaseholds, as their term expires, are reverting to the Crown, when they are likely to be made available in smaller

holdings. Whether the change will be to the detriment of the industry or not remains to be determined. Where small runs are established their owners are usually more closely associated with their own property management.

Heavily Timbered Downs Country.

This class of country is usually regarded as light carrying country, but safe, owing to the presence, besides grass, of many edible trees and shrubs.

To get the best results out of this class of country, systematic ringbarking should be carried out in order to kill out all useless trees, thus giving grass and edible herbage a better chance to develop, while still retaining sufficient trees to provide necessary shade and a reserve of fodder for dry times besides affording a windbreak for the protection of the pasture.

Scrubby Country

This class of country carries little or no grass and can be greatly improved by ringbarking the major portion, but allowing shelter belts to remain.

The amount of dry timber after ringbarking would be excessive, and difficult for sheep to go through, therefore it may be beneficial to run a fire over the first growth of grass when dry.

To clean the surface of all timber, however, may be inadvisable, and not of benefit to the pasture, for otherwise the land surface would be subject to the direct rays of the sun and to the drying or scorching effect of hot winds.

The Plateau Divisions.

These may be described as the south and central plateaux and lie between the contour of the coastal areas and the western divisions, taking in the Darling Downs, part of the Burnett and Clermont, and the Springsure districts, where we meet a variety of changes in soil, climate, and rainfall.

On the Darling Downs many owners run small flocks in conjunction with mixed farming. Both the merino and Corriedale breeds are successful as well as the progeny of the British long wool and merino crosses.

The Burnett has few sheep, but with closer settlement on suitable areas mixed farming practice should warrant the introduction of many small flocks. The central plateaux, including the Springsure and Peak Downs areas, run large flocks of sheep, chiefly merino.

Much further improvement and general development is necessary in this class of country. In large areas the advantage of judicious ringbarking of useless timbers has yet to be experienced. Cattle and sheep, to be run successfully, must have their respective paddocks, though they may be allowed to run together at times, especially in good seasons. The sheep should have a secure paddock in which they can be kept when necessary.

If a dairy herd is greater than can be conveniently worked the farmer's income can be greatly augmented, at little labour outlay, by running a flock of sheep sufficiently large to stock up the spare pasture. In a dry season when little or no return is obtained from the dairy herd the sheep will usually maintain their share of the earnings; therefore, the economic value of sheep as income-producers should be recognised when considering mixed farming. Working from north to south, we find large areas suitable for mixed farming, including much of the Clermont, Peak Downs, Springsure, Burnett, Darling Downs, and Maranoa districts. Many places are to some extent isolated from the railway, and where holdings of a fair area are made available grazing only can be followed with success. Still, cultivated crops should be grown in order that the quantity of fodder to tide over times of scarcity shall be held in reserve, thus getting over the difficulty and expense of freight and cartage.

In this plateau division there are large areas thickly timbered. Where green timber is in abundance sheep will not thrive owing to the grass being usually sour. The varieties of trees it carries indicate to some extent the nature of the country. Brigalow and belah scrub lands are practically useless for sheep until the timber is killed, after which it gradually improves, becoming first class for sheep breeding and wool growing. Ringbarking is recommended as against falling and burning, chiefly to avoid suckering.

Box and sandalwood country in this area is suitable for wool growing. It is light carrying country, but by judicious ringbarking it can be improved wonderfully. Patches of shelter belts should be left in suitable places and odd trees left in regular stands as breakwinds. Speargrass occurs heavily, as a rule, in bloodwood and ridgy country. Although in other respects of good fodder value, it is to be avoided for

sheep growing, particularly from the time it matures until it sheds its seeds. By bringing this class of country under cultivation, if possible, for a season or two the speargrass may be eradicated, and useful crops secured. On reverting to grass this land usually becomes first class for sheep.

Much of the country in the plateau area, now devoted to carrying wethers for wool production, could be put to much more profitable use by running a ewe flock properly cared for. A ewe flock could not be expected to produce as much wool as wethers, but with the addition of the quantity of wool produced from, say, a 60 per cent. lambing, the difference would be but slight. However, it is in the natural increase where the advantage is secured, and in country where the rainfall is from 20 to 30 inches, and where part of the run is suitable for cultivation, the aim should be to produce crops either for grazing the ewes and young lambs or for conserving it for fodder against times of scarcity. In this connection, there is a big opening for further development, and should the fodder secured in good seasons be held as a reserve against lean periods the sheep industry would not be subjected to such heavy losses as have recurred from time to time. To carry the number of sheep now depastured on most of the holdings in Queensland at the present time is, under existing conditions, certainly running a risk. Experience has taught us that, even when comparatively small numbers of sheep had large areas to roam over, heavy losses occurred for want of sufficient nourishment.

That country varies considerably will be quite understood, and large areas will be found altogether unsuited for breeding purposes owing to want of quality in the pasture even during normal years. Where wethers are run for wool production only, this want of special quality in the pasture is not so seriously regarded, for if they do lose condition during the off season after frosts it is only what can be expected, and unless sudden changes occur the growth of wool will not be seriously affected.

By a regular, but not an over-abundant, supply of food wool will improve in both quality and condition. In country too poor for breeding purposes, or where an excessive growth of green timber is found, wethers are the most suitable to run; but on holdings favourably situated a breeding flock should be established and maintained. To do this in some districts is not difficult, but usually precautions regarding over-stocking are taken into consideration. However, all calculations will at times be upset, unless some provision is made to guard against a tendency to over-stock.

Unfortunately, many of our richer districts with a rainfall averaging 25 to 30 inches per annum are regarded as unsuited for breeding purposes. It is to these areas that the work of combined effort on the part of the stockowner, the agriculturist, and the scientist should be directed in order to secure the successful breeding of sheep of suitable breeds.

The Coastal Area.

This area embraces all the country between the Dividing Range and the sea, of which a considerable extent is useless for sheep, being either badly drained naturally or carrying coarse and unpalatable grasses. The areas with a good annual rainfall of from 35 to 60 inches, suitable and carrying good pastures, are, as a rule, used for dairying. Other areas embrace rich alluvial soils suitable for the production of a variety of crops. The holdings in this region are usually small as compared with those on the plateuax and in the Western Division, and dairying in combination with agriculture is the chief industry. I look upon the dairy cow as the most useful and profitable animal that can be run on the farm where climate and rainfall are suitable. With cows, pigs and fowls may be associated. Sheep farming should, however, be an added profitable line in mixed farming, and, if worked on right lines, should be the means of greatly increasing the wealth of this coastal country without in any way detracting from the value of any other payable enterprise.

Apart from wool production, the output of lamb and mutton would be increased. Through a system of a quick turnover in live stock, it would pay better to market many crops as mutton than to sell them as fodder. My contention is that some form of industry should be established that would act as a balance between over-production at low prices and stagnation. That this is possible with sheep in the coastal areas of Queensland I feel certain. Thousands of acres in this area could be put to much better use than is the case at the present time, and sheep farming under suitable conditions and with proper management is worthy of serious consideration.

The Northern Tablelands.

In conisdering this area the matter of local environment must be taken into account. We must concede the fact that sheep are very adaptable animals, but that adaptability may not be possessed by all breeds to fit all conditions.

Where the conditions are wettest the Romney Marsh should be selected. This breed will feed and hold condition when other breeds will shelter and suffer. As the demand for mutton is not supplied to the same extent in this part of the State as compared with others, higher local prices rule, and this should made the undertaking more profitable. Wool production in this area should be of secondary consideration. Where breeding can be carried on successfully the ewes should be sold as fats after rearing three or four lambs.

The breed possessing the strongest constitution and suitable to wet conditions and resistance to parasitical infestation should be chosen.

[TO BE CONTINUED.]

A GROWING QUEENSLAND ENTERPRISE.

The showrooms of the Queensland Pastoral Supplies, Ltd., in their new warehouse Bowen street, Brisbane, are fitted up on modern lines, a complete range of everything stocked being shown and clearly marked in plain selling figures for the convenience and information of patrons. The main showroom measures 100 ft. by 80 ft., and the actual warehouse floor space of this firm, since acquiring Perry Bros.' workshops, now exceeds 2 acres. The vast array of goods includes all groceries, fencing material, windmills, troughing, engines, gates, wireless, stoves and ranges, tools, kitchenware, furniture, and agricultural machinery. In addition, a display

Plate 132—Brisbane Showrooms, Queensland Pastoral Supplies.

of their valuable agency lines includes Hibiscus wire, Venus motor spirit and kerosene, Coleman lamps and lanterns, Hibiscus stock lick and auto-screw droppers, Beeman tractors, &c. A novel feature is a revolving summer-house, actually built up with all the various building material this firm supplies, including fibro-cement sheets, Wunderlich ceilings, cement tiles, rubber roofing and flooring, ten-test, and three-ply wood; inside are enamelled bath, cement tubs, wire gauze screens, stove recesses, and window shades. This enables those intending to build to see exactly the method that appeals to them—together with a comparison in cost.

Reading and rest rooms and a flat recreation roof are placed at the disposal of clients, together with free garaging of their cars.

This firm secured first prize at the recent Brisbane Exhibition for Hibiscus fencing wire, New Era separators, Astor wireless, and Hibiscus stock lick. Our readers can secure their large illustrated catalogue free of charge.

IODINE TO PREVENT DISEASE.

The part played by correct mineral feeding in keeping at bay such scourges of the dairy industry as mastitis, contagious abortion, and Johne's disease was emphasised by Lt.-Col. H. A. Reid, F.R.C.V.S., in an address on these diseases, which he characterised as "three foes of the dairy industry," before the South-Eastern Jersey Club, in London, under the chairmanship of Sir William Wayland. Col. Reid reviewed the very latest advances of modern science in dealing with these diseases, and pointed out that as no effective cure was yet known it behoved every farmer to increase the resistance of his cattle by ensuring an adequate mineral diet to them. The high light of interest in the speaker's address lay in his advocacy of a dosage of iodine. Iodine has been proved to be an agent of great value in conserving the mineral constituents of the body, and Col. Reid went so far as to say that the feeding of a small quantity of iodine daily by stock farmers would greatly lower the incidence of infection by the costly diseases mentioned above.*

Col Reid's address was as follows:—

I AM not going to refer to tuberculosis, because it would take me the whole afternoon to deal adequately with the subject. My address will therefore cover three diseases of almost equal importance—Johne's disease, an affection which is of almost equal importance with tuberculosis and is increasing in this country; mastitis, a disease of the very greatest economic importance; and lastly, contagious abortion. Abortion is one of the greatest curses of all countries where cattle breeding and dairying are carried on. The various conditions attendant on the infection render abortion one of the worst afflictions cattle owners have to contend with.

Mastitis.

Of these three diseases I propose to deal with mastitis first. Mastitis is often called mamitis or inflammation of the udder, and by herdsmen garget or weed. This affection constitutes one of the most troublesome and costly enemies the cattle breeder has, and, from the point of view of treatment, one of the most unsatisfactory diseases with which we have to deal. Its sudden onset and its liability to affect cows at their most profitable period makes the disease very formidable. The cause of this trouble is an infection due to the entrance of a variety of micro-organisms—the streptococcus called *mastidis*. This is the common causative agent, though many others may be implicated. It gains entrance to the udder by way of the teat canal, and also through sores and abrasions on the skin of the udder and the teat, which is a frequent source of mastitis in cattle.

Predisposing Causes.

The predisposing causes I consider are: First, an abnormal development of the udder due to selective breeding for milk production, which has resulted in the production of large udders. There is obviously a wider field for infection to take place, and also there is a greater liability to injury. There, again, in these high-yielding cows you have an abnormal pressure of milk, causing dilation of the teat sphincter. The presence of flies which occurs in summer helps to convey the organism from cow to cow. Again, insanitary conditions help towards infection. Colds and draught also render the cow susceptible to infection. The trouble used to be always attributed to chill in the old days, but that was only a predisposing cause, the effect of chill being, of course, to lower resistance. Herdsmen still attribute enormous importance to chill, draughts, and fresh air. You must, of course, be careful to have fresh air, and the herdsmen do not like it.

Mastitis must always be regarded as contagious, and the appearance of one case is liable to be followed by further outbreaks, especially where sanitary measures are neglected. A case of mastitis should immediately be isolated. Then the practice resorted to by commercial milk producers in allowing the first few drops of milk to fall on the floor; failure to wash before milking; failure to observe general cleanliness in the byre and disinfect milking machines properly—all these might contribute to bringing about the disease.

Danger to Public Negligible.

As to the danger to public health from this disease, I think this has been greatly exaggerated. To begin with, milk from an inflamed quarter must not and would not be mixed with other milk. I do not think, therefore, that this is often the case, except occasionally by accident. In the course of my experience I have cultivated

* From a report in the "Livestock Journal" (England).

pure cultures of streptococci in milk I have consumed, and have persuaded my assistants to do likewise, and nothing has happened to us at all. That does not, of course, necessarily go very far. We were adults, and it does not necessarily mean that infants or delicate people might not be affected. At the same time, I do not think it is fair to try to sheet home to the cow all outbreaks of disease among humans. Infection depends on the length of the lactation. If the dry period of the cow be a short one, the organism may persist in the udder and recur after the next calving. Mastitis is more common among easy milkers, i.e., those cows with an easy sphincter. The use of a teat siphon for hard milkers is another frequent source of infection.

As regards prevention of infection, first of all cleanliness comes first, and then the intelligent use of disinfectants. Don't use them too strong, nor yet too weak. Every cowshed should be disinfected twice a year or more often. Milk should never be strippd on to the ground, but into a receptacle containing a little disinfectant. The cleanliness of the floor should be attended to, and an effort should be made to get rid of flies. Before milking, the hindquarters and the udder should be washed with a damp cloth dipped in some weak solution of disinfectant. After milking, the udder should be wiped dry. Cleanliness of the milkers is very important. Milkers should not be allowed to attend to septic cases, and then carry on their duties afterwards. The udders of overstocked cows should be eased.

With regard to treatment, very little progress has been made, and treatment remains palliative. The older the case the greater the difficulty of securing recovery. Vaccine treatment is being pushed somewhat at the present time, but I have come to the conclusion that it is of very little use at all. It will not prevent animals contracting mastitis, and it will not cure them. Moreover, in many cases, vaccine treatment may be attended with great danger. The use of antiseptic injections is also a method which has been in vogue for some time, but as a matter of fact you cannot disinfect the udder in this way when the cow is standing. We are thus reduced to palliative measures, such as fomentation, &c., and attention to the general health.

Contagious Abortion.

Abortion is a term which includes the conditions known as metritis, sterility, and difficulty of getting the cow in calf. The cause is infection of the womb by a specific bacillus—an organism which is easily destroyed by disinfection.

The method of infection is generally by swallowing contaminated food or water, or by licking the parts of other cows soiled by infected passages. The role played by the bull in conveying infection is now considered of secondary importance. Although there is some danger, perhaps, it is a remote one. It is important to realise that the udder acts as a reservoir of infection in these cases, and on pregnancy the infection proceeds to the womb. Abortion usually takes place between the fifth and sixth month, but this is liable to wide variations.

Acquired Tolerance.

It is important to realise that tolerance to infection may be acquired, and possibly an immunity established. Calves reared in infected herds possess a degree of tolerance to the disease, but they may constitute carriers.

Methods of diagnosis employed are—(1) the agglutination test, and (2) the *abortin* test. The latter is a preparation similar to tuberculin. In aiming at control of the disease the herd must be divided into two—the infected and free animals—and separation must be complete. The clean herd must be tested periodically and all reactors transferred. All discharges must be burned, and douching must be gone on with until after all discharges have ceased.

As regards curative treatment, there is none worthy of notice. Is it possible to vaccinate cattle against the disease? Well, with the use of dead vaccines the results are considered to be more or less worthless, but the results from live vaccines are more promising. There are, however, a good many dangers attendant on the use of live vaccine. You run the risk of converting the hitherto clean cow into a carrier.

Undulant Fever.

Another danger is the relationship between bacillus of abortion and undulant fever of humans. The medical people say that if the organism you introduce into the cow is a living one it will be shed in the milk and find its way into the public milk supply, and may give rise to the symptoms of undulant fever. Quite a number of cases in this country and America have been alleged to be due to infection from this source. For my part, however, I think the chances of danger are remote.

Johne's Disease.

Johne's disease affects both bovines and sheep. It is a serious and steadily increasing disease, comparable in its ravages with tuberculosis. The disease may be present in cattle for months before symptoms become evident, and during that time such cattle act as potential centres of infection for others. The symptoms are unthriftiness, wasting, and diarrhœa.

No recognised cure exists. Early diagnosis and the slaughter of infected stock is at present the most economical method of control. In certain cases it may be worth while to attempt treatment to check the diarrhœa, as, say, in the case of valuable cows, until after the birth of the progeny. An injection of formalin and dilute sulphuric acid has led to good results.

As regards diagnosis, the preparation *Johnin* inoculated intra-dermally has proved of value in revealing the presence of the disease. The employment of tuberculin made from avian tubercle bacilli was also used. Another method of diagnosis was the microsopic examination of scrapings of the bowel wall. Various forms of vaccines have been tried in an endeavour to find a preventive, but none so far can claim great success. Early diagnosis and elimination of the infected cattle is the most prudent course. As to infected pastures, one observer (Dunkin) recommends chain harrowing in two directions until all cow pads have been broken up. After this the fields should be dressed with one ton of fresh quick lime per acre, or on clay soils one and a-half tons to the acre.

Minerals Essential.

It will be gathered from what I have said that no specific treatment for any one of these diseases exists. The modern tendency, however, is to aim at prevention, and in this connection it is immensely important to realise that in cattle feeding an adequate mineral supply must be provided in the ration. The feeding of the concentrated foods used for high yielders tends to cause a still further loss of lime salts to the tissues. Recent work on animal nutrition suggests that many health troubles are due to the comparative lack of minerals in the artificials.

It has been shown by various workers that iodine acts as a conserving force to the mineral elements of the tissues. I should like to read a formula of a typical mineral diet which is advocated by Major Wall, a stock breeder in Natal:—

Bone meal, 40 lb.; finely ground limestone, 40 lb.; common salt, 20 lb.; flowers of sulphur, 5 lb.; oxide of iron, 1½ lb.; and iodine of potash, 3 oz.

This is suitable for all classes of stock. The value of iodine lies in the fact that the thyroid gland, which plays a prominent part in defending the body from disease, must be fed with this substance. Heavy manuring of pastures has been shown to exhaust the iodine content.

I would suggest that, in relation to the diseases I have mentioned, if this system were adopted of giving susceptible animals iodine in very small doses, then we should see a distinct decline in the incidence of these infections.

The Discussion.

Mr. E. Corrie, who opened the discussion, said that Col. Reid had mentioned three particular diseases which affected dairy cows, and which were incurable, but he thought there was probably a much longer list. It was time that the farmer appreciated that he himself was the primary cause of a great deal of the trouble which was occurring among live stock in this country. He was absolutely certain that a great deal could be done to prevent disease among live stock and humans if care was taken that they absorbed sufficient of all the elements essential to reproduction and so forth. Mineral feeding had come to stay, and was going to be accepted as a necessary part of the feeding of live stock. These facts were significant:—

Mastitis and other diseases attacked the cow just at the time of greatest drainage on the system.

The iodine content of colostrom or first milk was greater than of any other milk.

Iodine deficiency was, he thought, at the root of a great many of the troubles which occurred among young animals. He instanced a case of a farm in West Sussex where Johne's disease had taken a heavy toll for many years. He persuaded the owner to try feeding iodine, and he had a letter from him recently, saying that he felt satisfied that the disease had been cleared from the stock.

The Young Farmer.

CARE OF THE CREAM SEPARATOR.

At the Annual Conference of the Tweed and Brunswick Sub-district Councils of the Agricultural Bureau of New South Wales, held at Mullumbimby recently, Mr. J. C. McKenzie (Manager, Norco Ltd.) read an interesting paper on "The Manipulation and Care of the Cream Separator," which we reprint hereunder:—*

To start with I would explain that the old saying, "Familiarity breeds contempt," might well be applied to the separator, for quite a few of us have almost, one might say, been reared either on or close beside it; at least, it has been on every farm in this district for many years.

A separator is built to separate cream from milk, at a given correct speed, with a correct flow (or feed) of milk, and at a correct temperature (blood heat), yet we find if we put a watch on the revolutions that very often we are turning too fast or too slow and immediately try to remedy the wrong. It is only after quite a long period of trying that we are able to keep it near enough to the correct speed. We turn the milk on; and here I might say that quite a lot of our troubles are due to the fact that, while the maker of the separator, who should know something about the mechanism, has provided a vat and tap of certain dimensions to feed the machine, we imagine the vat too small and hard to keep filled, &c., and consequently get a bigger vat built by a tinsmith, who perhaps puts a tap and connection on the vat which in most cases varies the rate of intake intended by the maker. The consequence is that the machine is expected to do more than was intended—a 100-gallon machine is perhaps expected to separate 120 gallons per hour. If we look at the thing reasonably we have to admit that we are asking it to do more than it can, and we must not forget that if we put the milk into the machine it must come out of one or other of the outlets or overflow, so it is very necessary to see that the feed is regulated correctly.

Early Separation Advised.

Sometimes we find (in cooler weather especially) that by the time milking is finished and separating nearly, the cream has risen to the top of the milk yet to go through the machine. The natural tendency is for the operator to stir up the milk (with a metal, not a wooden stirrer, we hope) in order to break the cream and then put it through the separator. This again is asking the machine to do something it was not built to do—i.e., to take a large accumulation of cream out of a small amount of milk. It is therefore advisable to separate the milk while still as warm as possible after milking, and to prevent the cream from rising to the top of the milk in the vat by keeping it stirred during separating.

After the milk has been put through the machine, clean warm water should be used to flush the cream remaining in the machine. Water is preferable to milk for this purpose, as milk will sour, and thus affect the keeping quality of the cream, so it is not advisable to put milk into your cream if you wish it to be of the best quality. After separating, it is very essential that the machine be taken down immediately and the parts put into warm water. Wash the parts carefully with a good stiff brush, and rinse in plenty of warm water. Each part should be plunged into boiling (actually bubbling) water and allowed to remain for at least three minutes, then taken out and hung up in an airy place to drain. The dishes need special care after scalding, and they should be spaced sufficiently apart to prevent drops of water clinging to them.

When Cash is Lost.

Quite a number of farmers consider farm work more important than the running and cleaning of the separator, and consequently leave it to someone else, probably a hired youth or man, and forget, temporarily at any rate, that the separator is one of the principal factors determining their incomes. If it is not separating all the cream, they are losing cash, and if it is not kept thoroughly clean it will be the cause of second-grade cream, which means a loss of 2d. per lb. on their returns.

* From the New South Wales Agricultural Bureau Record, New South Wales Department of Agriculture, 18th July, 1930.

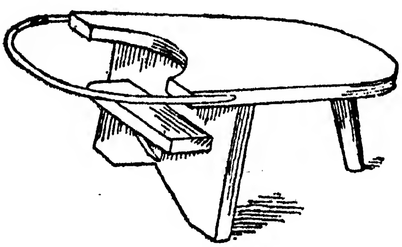
The Cream Screw.

Here is another matter which has a bearing on variations in cream tests. It is not an uncommon belief that, provided the cream (or regulating) screw of the separator remains unaltered and the rate of inflow and speed of the bowl are the same, the test of the cream will be the same, irrespective of the test of milk put through the separator. That is to say, if we had one lot of milk testing 4 per cent. butter-fat and a similar quantity of milk testing 3 per cent. butter-fat, and if these were put through the same separator under the same conditions as to temperature, rate of inflow, speed, &c., the test of the cream from each lot would be the same. This idea is not correct, as we will see if we follow it out. First of all, the function of the cream screw is definitely to proportion the milk or cream which flows through each outlet. When we alter the cream screw we alter the proportion coming from each spout, resulting in either more separated milk and less cream, or less separated milk and more cream. The test of the cream is altered indirectly in this manner, by increasing or reducing the amount of separated milk flowing through the cream spout. The alteration of the cream screw does not influence the amount of butter-fat which flows through the cream spout, but it results in a greater or smaller amount of separated milk passing through with the cream, which in turn gives the cream a higher or lower test. The average cream screw is set so that about one-tenth of the bulk will be delivered through the cream spout and nine-tenths through the separated-milk outlet. These proportions will vary slightly from time to time according to the set of the cream screw, but they will always remain the same in any one separator, provided there is no material difference in the temperature and rate of inflow of the milk, the speed of the bowl, &c.

While the butterfat test of the milk in the vat is the same, the test of cream will be the same under similar separating conditions, but as the test of the milk varies with weather conditions or seasons, the test of the cream will vary accordingly, unless the cream screw is adjusted to make up for the variation. To illustrate this point, let us take 100 gallons of milk testing 4 per cent. butter-fat and another 100 gallons of milk testing 3 per cent. butter-fat and put them through the same separator under exactly the same conditions. Let us assume that the cream screw has been set to deliver one-tenth through the cream spout and nine-tenths through the separated-milk spout. (For the purpose of this illustration the loss of fat in the separated milk can be neglected, as it would be the same in each case.) We would find that in each instance we had 10 gallons of cream. The lot from the 4 per cent. milk would test 40 per cent. in the cream, and the lot from the 3 per cent. milk would test 30 per cent. in the cream. We will thus see that though we put the two lots of milk through the same separator, under the same conditions, there is a difference of 10 points in the cream test. It will thus be seen that any variation in the test of the milk in the vat, from day to day, or month to month, will cause a corresponding variation in the cream test. If this point is properly understood, it will explain many variations in cream tests which at first sight may seem difficult to understand.

MILK STOOL.

The stool is made of three pieces of board and a piece of round iron. The appearance and manner of construction are clearly shown in the illustration. The seat board is sawn out to fit the circumference of the bucket to be used, and the



iron is also bent to this curve and fastened to the board as shown. The little shelf on the front support holds the bucket at the right height, and keeps it clean and out of the way of the cow's foot while milking.

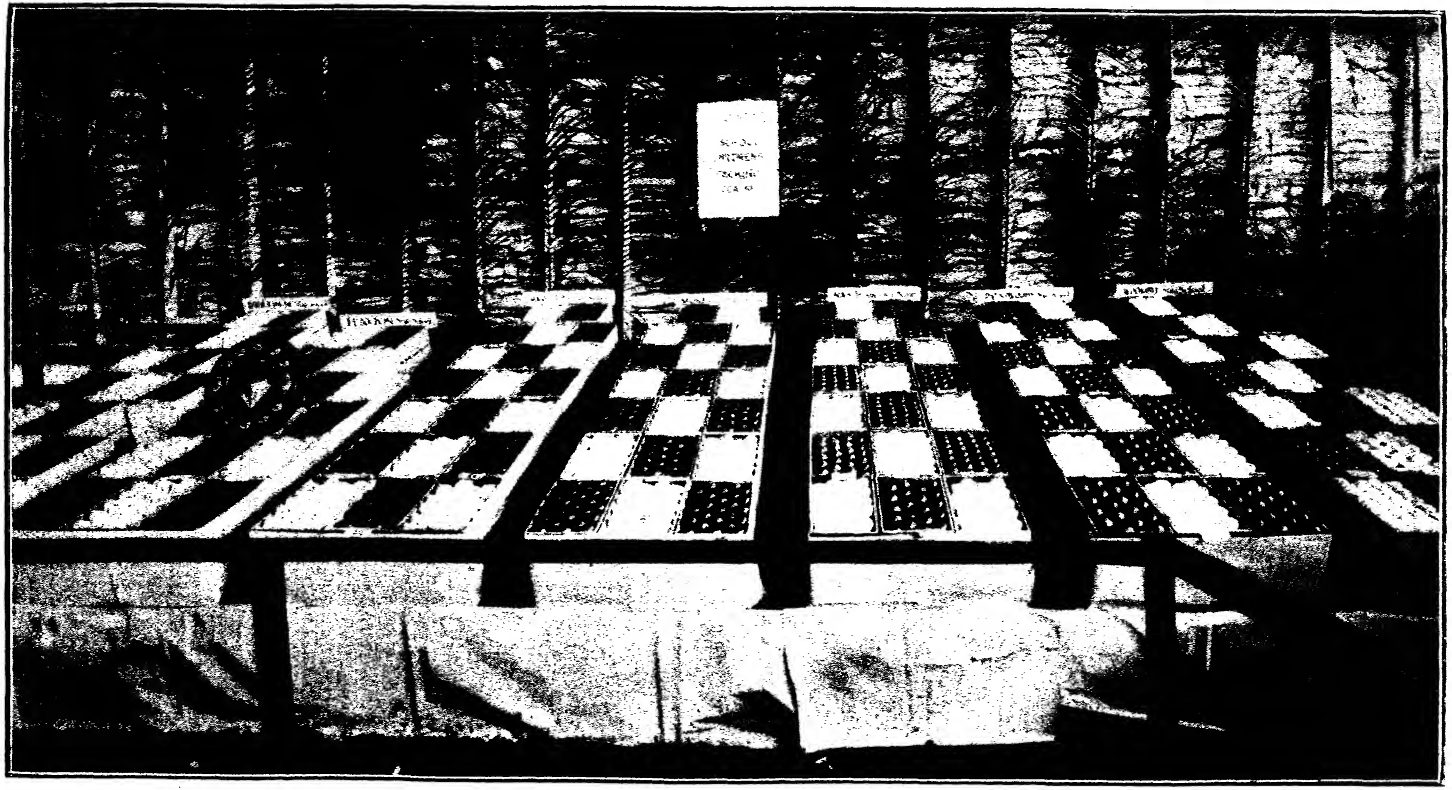


PLATE 133.—JOHN MACDONALD SHIELD COMPETITION FOR SCHOOL CHILDREN'S PACKING CLASSES. ROYAL NATIONAL ASSOCIATION SHOW, 1930.

This exhibit illustrated the value of the instruction arranged by the Education Department, in co-operation with the Department of Agriculture and Stock. The first award was won by the Flaxton State School.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Weeds Indentified.

"INQUIRER" (Mount Larcom)—The specimens have been determined as follows:—

(1) *Verbena bonariensis*, Purple Top, a common weed in Queensland, a native of South America but now widely spread in most warm countries.

(2) *Verbena macrostachya*, a native species of Vervain.

(3) *Malvastrum spicatum*, a weed of the Mallow family (Malvaceæ), very common in Queensland but for which I have not heard a common name.

All the foregoing are common weeds in Queensland and are not known to taint milk particularly more than the general weedy taste one gets in milk of cows fed largely on such fodder.

(4) *Carissa ovata*, a very common shrub and the only local name we have heard for it is Burr Vine, a rather ridiculous name as the plant is really a shrub, not a vine. In spite of its prickly nature, the plant has some reputation as a fodder in the district in which it grows. It extends some little way inland to the Brigalow and Bellah country. We do not think it would taint milk particularly.

Western Wonga Vine.

C.W. (Cooladdi, Western Line)—

The specimen is *Tecoma Oxleyi*, the Western Wonga Vine. It is not common in Queensland; in fact, the only other authentic specimen we have of it in our herbarium is from near Adavale; hence I was rather glad to obtain the specimen from you. It also grows in Western New South Wales and Central Australia. The broader leafed species *Tecoma australis* is fairly common on the coast and middle west.

Wild Passion Vine.

D.S. (Dululu, Dawson Valley Line)—

The specimen is the White Passion Vine or Wild Passion Vine (*Passiflora alba*), a native of South America, now naturalised and a very common weed on scrub farms in coastal Queensland. It is particularly abundant after a scrub burn. Feeding experiments carried out some years ago by the Department of Agriculture and Stock showed the plant to be poisonous. One feature brought out by the experiments was that the poisonous property of the vine is of a cumulative nature and that evidently a certain amount of the material must be eaten before symptoms of poisoning are made manifest. Regarding treatment the late Dr. Sydney Dodd, who carried out the feeding tests, made the following recommendations:—

"With regard to treatment of affected animals, first remove them to fresh quarters so that they are unable to obtain any more vines. If there is no difficulty in swallowing they should be given a drench of 1½ pints of linseed oil, by the mouth, in order to loosen the bowels. Epsom salts are not advisable, as in some cases there is inflammation of the bowels present. Working bullocks should be spelled until recovered. With animals in what may be termed the first stages of the disease, that is, those showing drowsiness and stupor, loss of appetite, and condition, &c., the best remedy is the injection of 18 drops or 1 c.c. of 1 per cent. solution of strychnine under the skin behind the shoulder, once a day for a few days (four or five) by means of a hypodermic syringe. For animals in the latter stages, that is, where convulsions are appearing, a sedative in the form of 6 drachms of bromide of potassium in a pint of water should be given as a drench, providing the animal is able to swallow, but it appears that in some cases this ability is lost. In such cases no drenches should be given at all, owing to the danger of the liquid 'going the wrong way' and so setting up inflammation of the lungs. The strychnine should be recommenced when the convulsions have disappeared."

Wild Millet. Louisiana Carpet Grass.

G.G. (Boonjie, Peeramon)—

The grass with seed head (a) is *Panicum crus-galli*, the Wild Millet. This grass is generally looked upon as one of the wild parents of such well-known cultivated fodders as Japanese Millet, White Panicum, &c. There are numerous forms of it scattered throughout the world of which several occur in Queensland, and the one you send seems to represent the common annual form which occurs in Queensland mostly as a weed in cultivation. It has, however, considerable forage value.

The other grass was not in seed but we should say it is *Axonopus compressus* or *Paspalum compressum*, the Louisiana Carpet Grass. This grass has come into prominence in the last few years in the Northern Rivers of New South Wales and Southern Queensland as a useful species for growing on the poorer classes of soils where the other grasses such as common Paspalum and Rhodes grass will not do.

"Chain Fruit" (*Alyxia ruscifolia*).

H.G. (Nanango)—

The specimen is *Alyxia ruscifolia*, sometimes known as Chain Fruit on account of the peculiar habit of the berries being apparently borne one on top of the other. It is a handsome shrub, either in flower or fruit. It can be propogated from seeds, or young plants may be readily transplanted from the scrub. The root wood has a pleasant smell, something like Orris Root. We do not quite know the plant you refer to with red berries growing in Tasmania, but we should not think it would be an ally of the present species.

Kikuyu Grass.

W.J.A., (Kin Kin, N.C. Line)—

The sample forwarded bears no seed heads, but there appears to be no doubt that it is Kikuyu Grass—*Pennisetum clandestinum.* There are certainly no specimens of *Axonopus compressus* (*Paspalum compressum*) mixed with it.

Kikuyu Grass is most readily distinguished by its flowers from all other grasses grown in Queensland. These are partially or almost entirely enclosed by the sheaths of the leaves at the tip of the shoots, and the anthers (male organs) are produced on conspicuous hair-like white stalks up to two inches long. Unfortunately, it does not flower freely, so that this means of distinguishing Kikuyu is not always available. The majority of grasses cultivated in Queensland, however, produce flowers in abundance. Carpet Grass, with which Kikuyu might be confused, has minute flowers arranged in two to four slender spikes at the apex of fine stems which are exserted from the sheaths of the leaves. Vegetatively, Kikuyu differs from Carpet Grass in several ways. The sheaths of the leaves are very loose and rounded, the leaves under cultivation are longer, narrower, and more pointed, whereas in Carpet Grass the sheaths are very strongly compressed, the leaves short, broad and blunt, and their margins fringed with minute hairs.

Stagger Weed or Wild Mint. *Phaseolus semierectus.*

W.A.A. (Esk)—

The smaller of the two weeds is *Stachys arvensis*, the Stagger Weed or Wild Mint, a very common winter and spring weed in cultivation paddocks in Southern Queensland and New South Wales. It causes staggers in working stock, but apparently is practically harmless to resting cattle. The question of the plant's being poisonous or not was rather a vexed one, but its power to produce staggers in working horses was definitely proved by feeding tests.

The larger growing plant is *Phaseolus semierectus*, a common tropical and sub-tropical leguminous plant, introduced into Queensland many years ago as a fodder. It is now moderately common as a naturalised weed in many places, but our experience with it in general is that stock do not take to it very much.

Chickweed.

G.P. (Rockhampton)—

The specimen is *Stellaria glauca*, a species of Chickweed. It is moderately common in some of the cooler parts of the State, such as the Darling Downs and the Granite Belt, but, so far as we know, has not previously been collected about Rockhampton. On that account we were rather glad to get the specimen.

Plants Identified.

H.F.M. (Waterford)—The specimens have been determined as follows:—

Aristida ramosa, a three-pronged spear-grass.

Panicum foliosum, Leafy Panic Grass.

1. *Salvia coccinea*, a native of South America, now naturalised as a common weed in many parts of coastal Queensland. Family *Labiatæ*.
2. *Diuris punctata*, a species of Ground Orchid. Family *Orchidæ*.
3. *Spermacoce brachystema*, a small plant of the family *Rubiaceæ*, very common in grassland in Queensland, but for which we have not heard a common name.
4. *Bowolkia elata*, a native of South America, common in garden culture. It belongs to the family *Solanaceae*.
5. *Solanum nigrum*, a cosmopolitan weed, commonly known in Queensland as Deadly Nightshade, Blackberry, Black Currant, and other names.
6. *Solanum pseudocapsicum*, the Jerusalem Cherry. A plant moderately common in gardens and here and there met with as a stray. The native country is not certain, but is generally believed to be Madeira.

Burr Trefoil.

S.S. (Glen Aplin)—

The specimen is *Medicago denticulata*, the Burr Trefoil, a very common legume or trefoil in Queensland and New South Wales. It grows rapidly during the winter months but dies away on the approach of hot weather. It is generally regarded as a very useful fodder, and when the leaves die off, a number of little burr-like pods are left. These latter are quite greedily eaten by sheep. The plant would be valuable as a cover crop and for ploughing in for green manure, but seed, as a general rule, is not stocked by nurserymen. Once it obtains a footing on a property, however, it generally multiplies itself fairly well.

Cape Chestnut.

J.J.L. (Toowoomba)—

Your specimen is *Calodendron capense*, the Cape Chestnut, a native of South Africa belonging to the family Rutaceæ. It is a very handsome flowering tree, much cultivated about Brisbane on account of its showy character. We do not remember seeing the plant about Toowoomba, and the tree may be a bit tender with you.

PIG RAISING.

Tuberculosis in Pigs.

F.B.K. (Franklyn Vale, Grandchester)—

We are referring your letter on to the Chief Inspector of Stock for attention, and he will write you further re tuberculosis. However, it is quite apparent the young pigs to which you referred did not die as a result of tuberculosis. They probably died of constipation and as a result of the development of a form of pneumonia. This trouble developing rapidly would be responsible for the discoloured condition of the lungs. It is unlikely that tuberculosis would affect pigs two weeks old, nor is it to be assumed that because young pigs' tails drop off they are suffering from a contagious disease. This latter trouble may be due to sun scald or to some accidental cause, but though it seems a coincidence that the tailless pigs were condemned while those with tails were free of disease, this is not an indication of tuberculosis, but the fact that some of the pigs were condemned indicates that there is infection on the property, and this needs to be cleaned up.

To Rid Pigs of Lice.

H.C. (O'Bil Bil, Gayndah Line)—

To rid pigs of lice prepare a mixture of ½ pint of benzine, ½ pint kerosene, and 7 pints of waste oil. Mix well, and after washing the pigs to free them of accumulations of mud, &c., apply freely, either per hand or with a soft cloth or brush. Be careful to apply the oil inside the ears and around the head and neck, and in the wrinkles along the side. Otherwise a number of lice will escape and go on breeding. The very small white nits seen around the neck and shoulder of the pig are the eggs from which the young lice hatch out. Repeat the application of oil about ten days after the first treatment, and then periodically. Meantime clean up all old rubbish and cleanse pens thoroughly of all harbouring places, such as under bark and splinters of wood, old pig crates, &c.

Your system of growing plenty of green food and grain is the ideal one in profitable pig-keeping, and we feel you are on the right track in so doing.

It pays to provide oiling posts in the pig runs; a good stout post with a piece of sacking tacked about 12 to 18 inches from the ground is used. Keep the sacking or a piece of short woolled sheep pelt saturated with oil and the pigs will soon learn to oil themselves and keep themselves free from parasites.

Yes, it is an advantage to provide a mineral mixture, and several references to suitable mixtures are made in the pamphlets. Corn, sweet potatoes, and milk, plus greenstuff like rape and barley, lucerne, succulent grasses and herbage, plus minerals and drinking water will provide ample material for a balanced ration.

Top dressing the pastures will prove a distinct advantage and be well worth the expense incurred.

It is good to know you so much appreciate the various articles that have appeared in the Journal; the objective is to make the publication as informative and interesting as is possible.

Pig Food a Profitable Investment.

T.A.C. (Wamuran)—

We suggest you grow as much of the food as is possible, for only in this way can pigs be made a profitable investment on Queensland farms.

The articles that appear regularly in the "Queensland Agricultural Journal" on Farm and Garden crops are well worth close study, while the Agricultural Instructors will send along specialised information, on request, re any particular crop.

Pig Management.

R.R. (Kin Kin)—

We would suggest getting rid of unsatisfactory strains of pigs and replacing them with healthy well-developed stock, for good stock can be procured at reasonable rates and they would give you a good start again, but they would need to be kept in good grazing paddocks and be fed liberally, and carefully attended to. Possibly the trouble you refer to may also be due to the pigs suffering from constipation or bowel disorders or to bush tick poisoning; these diseases producing symptoms similar to those to which you refer. These troubles are all referred to in the pamphlets. We suggest you should give your pigs a complete change of food, turn them out into grassy runs, and be sure they have a warm dry bed at night. Feed milk and similar foods in a warm condition until the animals recover, and keep plenty of succulent greenstuff before them. Give charcoal and other mineral matters like bone meal, and follow advice given in the pamphlets re the regular use of mineral matters. Pigs of all ages require ample supplies of drinking water at all seasons of the year. Examine the pigs for lice and ticks, and if they are infected follow advice given re the use of oil, &c., for freeing the body of lice. The trouble is entirely constitutional and dietetic and must be handled carefully. We feel sure if you take this matter up in earnest and give it close attention you will have good results.

FRUIT CULTURE.

Citrus Pruning.

G.D. asks:—When pruning and cutting big limbs from orange trees, what would you advise to put on the cuts to prevent dry rot? I have heard that cold tar meets the case, but would like to have an opinion on it.

The Director of Fruit Culture, Mr. George Williams, advises:—Where big limbs are cut out of orange trees, provided the cut is made as nearly parallel to the stem or limb from which it is detached, there is no occasion to apply any preservative to the wood. The cut surface should be evenly pared, particularly around the edges, with a sharp paring chisel.

Lameness in Cattle.

"INQUIRER"—

Lameness in cattle is caused by overgrowth of the horn of the hoof, mud-balling, or other irritation caused by foreign bodies in the hoof cleft. Do not allow the toes to become excessively long or turn inwards or outwards. Remove excessive horn growth with a rasp or sharp-cutting pair of pinchers.

Foul foot of cattle is caused by a specific bacillus, and the predisposing factor for this condition is muddy yards, waterholes, and around drinking troughs. Recovered cases are carriers of this trouble, and care should be taken to pave all likely places and keep carriers out of muddy yards. The bacilli gain access to the feet through cuts or bruises between the clefts of the feet.

A proper foot bath should be constructed in one of the bails, 6 feet long, 3 feet wide, and 6 inches deep, sloping in on all sides, and the cows bailed up in this bath for a few hours daily, fed and watered and kept out of the mud.

The solution for the bath consists of 1 oz. of phenyle to 1½ gallons of water, preferably rainwater.

In the case of one or two quiet animals being affected, a foot bath, made out of a kerosene tin cut and the edge turned over, would suit the purpose.

The following solution may be used for soaking the foot:—Phenyle, 1 oz. to 2 gallons of rainwater. Soak for one hour morning and evening, and keep the animal in a dry paddock out of the mud.

Poisoning Weeds on Earth Tennis Court.

C.C.R. (Jondaryan)—The Director of Agriculture, Mr. H. C. Quodling, advises:—

With reference to the poisoning of weeds on an earth tennis court, and also on a garden path, the use of Sodium Chlorate is recommended for both purposes. You are advised to communicate with the A.C.F. and Shirleys Fertilizer Company, Roma street, Brisbane, for particulars of this poison and for information in respect to the methods of application. Arsenical compounds are not recommended for use on tennis courts or garden paths for killing weeds.

AN ENGLISH PIG BREEDER'S APPRECIATION.

The Manager of the Baydon Herd of Large Black Pigs, Marlborough, Wiltshire, England, writes:—

"Many thanks for the pamphlets and leaflets on the subject of Pig Raising and for the Agricultural Journal; they are all very interesting, and I like the way you have placed your suggestions in the various breeds, ailments, and systems of management before your farmers.

"You are in front of us in England in the practical way you try to induce your farmers to keep the best in the best manner. I think your pamphlet on 'Paralysis of the Hindquarters in Pigs' is exceptionally good. The illustrations convince the most 'pig-headed' people."

General Notes.

Amendment to Honey Board Levy Regulations.

On the 21st August, 1930, Regulations were passed empowering the Honey Board to make a levy on honey growers to provide for the administrative purposes of the Honey Board. This levy is at the rate of 1½ per cent. on the proceeds of all honey sold from the 23rd August, 1930, to the 22nd August, 1931. As the Board applies also to beeswax, these Regulations have now been amended to apply also to all sales of beeswax in Queensland during that period. Thus the levy will now be at the rate of 1½ per cent. on the proceeds of the sales of all honey and beeswax in Queensland.

Staff Changes and Appointments.

Mr. W. E. C. Smith has been appointed Canegrowers' Representative on the Invicta Local Sugar Cane Prices Board, vice Mr. P. Hayes, resigned. Mr. G. R. Bush, of Maroochydore, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

The transfer of Mr. M. Custance, Inspector of Slaughter-houses, Townsville, has been cancelled, and Mr. M. Flanagan, Inspector of Slaughter-houses, Bundaberg, has been transferred to Warwick instead of to Townsville. Mr. J. Bishop, Inspector of Stock, Nanango, has been transferred to Kingaroy, and Mr. T. Douglas, Inspector of Stock, Kingaroy, has been transferred to Nanango. The headquarters of Mr. L. D. Carey, District Inspector of Stock, have been transferred from Emerald to Springsure. The Officer in Charge of Police at Mungana has been appointed an Acting Inspector of Stock, and the appointment of the Officer in Charge of Police at Alma-den as an Acting Inspector of Stock has been cancelled.

The appointments of Messrs. L. L. S. Barr and A. J. Browne as Agents under the Banana Industry Protection Act have been cancelled, and, in lieu thereof, Messrs. J. C. Wilson and B. Funnell have been appointed Agents for the Banana Board.

Mr. J. T. Tod has been appointed Chairman of the State Wheat Board for a period of two years from the 1st September, 1930, to the 31st August, 1932.

Mr. Harry Hayward, of Marcochydore, has been appointed an Honorary Ranger under the Animals and Birds Acts.

The Officers in Charge of Police at Forsayth, Georgetown, and Mount Surprise, in North Queensland, have been appointed Acting Inspectors of Stock as from the 30th August, 2930.

The following persons, all resident in the Innisfail and Tully districts, have been appointed Honorary Rangers under the Animals and Birds Acts as from the 30th August, 1930, for the purpose of protecting bird life in the canefields in those districts:—

Messrs. W. D. Davies, R. C. Lacaze, J. F. McCutcheon, S. Pagano, J. Valmadre, F. H. Gilmore, G. Myers, S. J. French, P. White, P. Volp, H. G. Knust, J. B. Skardon, T. O'Loughlen, H. H. Allison, P. F. Tierney, W. J. Burke, E. R. Campbell, A. F. Marty, J. T. McNamee, W. A. McRobbie, D. V. Woods, S. Theodore, H. Henry, G. Wilson, J. C. Proctor, H. Brannigan, G. F. Brett, and W. Moran.

Levies on Banana Growers.

On the 21st August two Orders in Council were issued providing for levies on growers of bananas to provide for the administrative expenses of the Banana Board and of the Banana Experiment Stations at Kin Kin East and Bartle Frere. The levy for the Banana Board was made at the rate of 1½d. per case containing 1½ bushels or less, and at the rate of 1½d. per three bunches of cavendish, five bunches of lady's finger, or six bunches of sugar bananas marketed by the growers, according to the method of marketing employed. The levy for the Experimental Stations was made at half the above rates.

The levies on bananas marketed in the bunch have been found to be unfair to the growers owing to the great differences in size and quality of the bunches marketed, and hence to the great differences in prices obtained for single bunches. These original Orders in Council have, therefore, been amended in so far as the levy on bananas marketed in the bunch is concerned. Therefore, from now on, the levy on bananas marketed in the bunch will be at the rate of twopence (2d.) in the £1 sterling on the proceeds of all sales as regards the Banana Board, and at the rate of one penny (1d.) in the £1 sterling as regards the levy for the Experimental Stations. The levies of 1½d. and ¾d. per case for bananas sold in the case still remain.

Barley Board Hail Insurance Regulations.

Regulations have been passed under the Primary Producers' Organisation and Marketing Acts to provide for a hail insurance scheme for the Barley Board. This scheme is almost identical with that operated by the State Wheat Board.

Two funds are to be established—a Hail Insurance Fund and a Hail Insurance Reserve Fund. The first, the Hail Insurance Fund, will be created by a levy in the form of a pro rata premium charge against all growers calculated on the basis of the quantity of barley harvested, and that on which Hail Insurance Compensation is payable each year. The levy will be a charge against the grower, and may be a deduction from advances, but the sum chargeable in any one year shall not exceed 7½ per cent. of the total value of the barley insured during the same year.

The Hail Insurance Reserve Fund will be created by a levy by the Barley Board on all growers of barley at the rate of one halfpenny (½d.) per bushel on all barley harvested in Queensland. This Reserve Fund will be limited to £2,000, and when that amount is reached no further levies will be made, except to recoup the fund when payments have been made therefrom.

Each of these levies is open to a poll as to whether they shall be made or not. If no petition is received the levies will automatically come into operation. If a petition is received a ballot will be held, and if the majority of those voting is against the levies such levy shall not be made. "Growers" for the purposes of these ballots will be persons who, at any time during the last twelve months, harvested for sale barley produced in any part of the State of Queensland.

Pineapple Levy Regulations.

The Pineapple Levy Regulations which have been in force since 1926, and which were to apply until the 24th January, 1931, have been rescinded, and new ones inserted in lieu thereof. These new Regulations will apply only for a period of one year from the 20th September, 1930—that is to say, until the 19th September, 1931. The means of collection of the levies remain unchanged, the only differences being in the amount of the levies and the methods in which they are to be expended. The old levy was at the rate of one halfpenny (½d.) per case of pineapples in containers, per forty-two rough or Ripley pineapples or per twenty-four smooth pineapples in instances where they were sold loose. From now on the levy will be at the rate of twopence (2d.) per case of pineapples sold in containers, or, in instances where pineapples are sold loose, at the rate of 2d. per forty-two rough or Ripley pineapples or per twenty-four smooth pineapples. This applies only to pineapples sent for ordinary domestic consumption. In the case of pineapples sent to any canner or fruit preserver, the levy will be at the rate of twopence halfpenny (2½d.) per case for every case of pineapples with "tops on," and three and one-third pence (3⅓d.) per case for every case with "tops off."

Approximately three-quarters of these levies will be expended to meet any possible losses incurred in sending overseas any processed pineapple products processed by or with the authority of the Committee of Direction. The balance of the levy will be expended only in the interests of the pineapple section of the fruitgrowing industry of Queensland.

The amended levies have the approval of the majority of the pineapple-growing districts of the State.

The Public Curator Office—Another Record Year.

The Balance-sheet and Profit and Loss Account of the Public Curator Office as at 30th June, 1930, shows a net profit of £8,491 0s. 11d. This constitutes a record profit since the inauguration of the Office on the 1st January, 1916. The accumulated surpluses now amount to £59,125 10s. 2d. As the Office is guaranteed by the Government, it will be noted that this reserve is available to make good any losses before the Government would be asked to honour its guarantee. The total cash receipts for the financial year amounted to a little over a million and a-quarter pounds sterling. In the year 1916 the cash receipts totalled slightly over a-quarter of a million pounds sterling only. These figures speak in concrete terms of the great growth of the Office over a period of fourteen years. This rapid increase may be accepted by the people of Queensland as genuine evidence of their appreciation of the benefits offered to them by the Public Curator Office.

The phrase "The People's Executor and Trustee" is an appropriate slogan used by the Public Curator, because his activities are purely in the interests of Queenslanders, and their benefit and consideration are his main desire. The handling of thousands of estates and individual trusts raises problems of a very special nature

very different from those arising out of a strictly commercial business. Apart from the question of safety (which, of course, is undoubted), not the least among these problems, is the assuring of the efficient and personal attention to which each estate is entitled. That this aim has been attained is very evident by the very large number of messages of appreciation and congratulation that have been received from time to time from satisfied beneficiaries and clients. Though to err be human, the Public Curator never passes on the cost of a mistake to his clients. The Office makes good its own errors.

As the Public Curator is a corporation sole, he runs his Office on purely business principles without interference in any way by the Government which happens to be in power at any time. This makes for public confidence, because no part of the public moneys is used in the payment of salaries or in the general upkeep of the Office, which is entirely self-supporting, and which is not in the slightest degree a charge on the general revenue of the State. The expenditure on the salaries of 180 officers alone amounts to £45,000 a year, or an average of £250 a year per officer. In 1916 the number on the staff was 39. In that year the investments amounted to £97,000. In 1929 they amounted to £1,020,776.

Banana Board Election.

On the 27th February last Regulations were passed under the Banana Industry Protection Act providing for the election of growers' representatives on the Banana Industry Protection Board. These Regulations, numbered 27 to 37, inclusive, have been rescinded, and new ones have been substituted therefor. The old regulations have been altered in several respects, of which the chief are as follows:—

The present Banana Board, consisting of two representatives of the Minister and two representatives of the growers nominated by the Committee of Direction of Fruit Marketing, will continue in force until the 30th September, 1931. The Board was due to expire on the 31st August, 1930, but, by means of such extension, no election will be necessary until 1931. The growers' representatives for each district (of which there are two, the same as formerly) must be nominated by growers resident in that district only, and no person shall nominate for more than one district.

All elections will be by preferential voting; under the old Regulations the voting was not to be preferential.

In the event of any vacancy on the Board caused by the death, retirement, or resignation of any member, the Minister may now either appoint some person qualified to vote at elections of the Board to fill the vacancy, or else order an election. The person so appointed or elected will hold office only until the time of the next general election of members of the Board.

There will be a separate election for each of the two districts, instead of one general election for the whole of Queensland as under the old Regulations.

Tomato Marketing.

On the 31st July last the Committee of Direction issued a Direction relating to tomatoes to come into operation as from the 15th September, 1930, to the 15th December, 1930. Petitions were sent in from various districts asking that an Order in Council be issued by the Governor in Council declaring that the tomatoes to which the Direction relates shall be acquired by the Committee of Direction as the owners. A ballot was accordingly held by the Committee of Direction, with the result that 68.85 per cent. of the votes polled were in favour of the acquisition. As the required majority of 60 per cent. in favour was obtained, an Order in Council has now been issued giving effect to the wishes of the growers.

The Order applies only to tomatoes grown in the Petty Sessions Districts of Maroochy, Caboolture, Esk, Woodford, Kilcoy, Redcliffe, Brisbane, Cleveland, Southport, Logan, Beaudesert, Wynnum, Goodna, Ipswich, Marburg, Laidley, Lowood, Harrisville, Dugandan, and Rosewood—briefly, the district bounded on the north by Nambour, on the south by the New South Wales border, and on the west by Rosewood, and including the islands in Moreton Bay. All tomatoes produced for sale in this area during the period of about three months from the 20th September, 1930, to the 15th December, 1930, shall be acquired by the Committee of Direction as the owners thereof. The Committee of Direction has the power to do such things as it thinks necessary for the purpose of enabling it to effectively carry out the marketing of such tomatoes as the owners thereof for and on behalf of the growers, and the only purpose for which it intends to use this power is to prevent the despatch to the Southern States of immature tomatoes. Any interstate contracts which had been entered into prior to the date of this Order will not be prejudiced by the acquisition. The Order will remain in force only from the 20th September to the 15th December, 1930.

Filing Crosscut Saws.

The work of sharpening crosscut saws is greatly facilitated by marking off the correct tooth angle, which is 30 deg., on the top of the saw clamp at 1-inch intervals. If the file is kept parallel to the marks while filing the saw the angle of the teeth is sure to be correct.

Codling Moth Control.

Fruitgrowers generally, and apple and pear growers in particular, will be interested in the result of an experiment carried out by the Horticultural Division of the Victorian Department of Agriculture on the trees of two orchards in the Doncaster district.

The trees were sprayed six times, the first spray consisting of 2½ lb. of arsenate of lead powder and 1 lb. of spreader, with 80 gallons of water. A week later a second spraying of 2½ lb. of arsenate of lead with approximately 3 quarts of Volck white oil and 1 lb. of spreader to 80 gallons of water was given. This was repeated three weeks later, and again three weeks after that. The fifth spraying, a little over a month later, consisted of 1½ gallons of Volck with 1 lb. of spreader to 100 gallons of water, and this mixture was again sprayed another month later as the sixth and final spraying.

The results on the apples particularly were outstanding. The fruit matured ten to twelve days before fruit on other plots not treated. The skin was very much brighter, cleaner, and more highly coloured. A careful check of the fruit when picked disclosed the fact that only a fraction over 1 per cent. of the fruit was infected, leaving practically 99 per cent. absolutely clean and free from infection. One of the big advantages of the late spraying with Volck is the absence of residue on the fruit when picked, thus eliminating the necessity of wiping the fruit.

The experiment brought to light the fact that Volck seems to repel the moth, or at least prevents it from recognising its hosts, as it was noticeable that fewer eggs were deposited on the fruit that had been sprayed with Volck.

Another conclusion come to by the experimenters was that an oil-arsenate spraying, such as arsenate of lead and Volck, controls scale insects and red spider as well as codling moth.

The result of this test, scientifically conducted by experts, points the way to the successful control of codling moth, which is an ever-increasing pest in this State. Growers interested in Volck white oil can obtain full information about it from the Queensland distributors, A.C.F. and Shirley's Fertilizers Limited, Brisbane.

Peanut Board.

On the 29th May last a Notice of Intention to make an Order in Council constituting a Peanut Board to apply to all peanuts produced in Queensland was issued. A ballot was held on the question of whether it should be made or not, and this ballot resulted with 346 votes in favour and 62 against the Pool, giving a majority of 84.8 per cent. in favour. An Order in Council has therefore been issued constituting a Peanut Board for ten years to apply to all peanuts produced for sale in Queensland.

All peanuts produced for sale in Queensland are to be a commodity, and will be divested from the growers and become the property of the Board as owners. All peanuts must be delivered to the Board in an unshelled condition, and a grower shall not remove any of the peanuts produced by him from his premises, except for delivery to the Board or its agents, unless the prior consent of the Board has been obtained.

The Board will consist of four elected representatives of the growers and the Director of Marketing or a deputy appointed by the Minister. The following have been appointed members of the new Board:—Messrs. F. C. Adermann (Wooroolin) and A. S. Clark (Sandhills), until the 27th August, 1931; and Messrs. F. G. Petersen (Kingaroy) and A. G. Whiting (Atherton), until the 27th August, 1932.

Persons entitled to vote at any referendum or election in connection with the Board shall be those who have produced peanuts for sale in Queensland at any time during the twelve months immediately prior to such election or referendum.

The old Peanut Board now goes out of existence, and this new Board takes over all the assets and liabilities of the old Board. The new Pool will last for ten years—that is, until the 27th August, 1940. The existing Peanut Board Levy Regulations dealing with levies to provide for storage facilities, &c., shall continue to be operative during the currency of this new Pool.

Fertiliser Facts.

Each succeeding crop that is grown lessens the fertility of the soil. That is a fact in nature that has been proved by the chemist, who can determine the proportions of nitrogen, P_2O_5, and K_2O present in the stalk and leaves of each variety of plant, and can thus calculate the total amount of those elements removed by each acre of crop. An average yield of sugar-cane, for example, removes 60 lb. of pure nitrogen (equal to 300 lb. ammonium sulphate), 50 lb. of phosphoric acid (equal to 240 lb. of superphosphate), and 140 lb. of pure potash (equal to 280 lb. of muriate or sulphate of potash).

This plant food has then served its purpose as nature intended. Like the coal that is mined and used for industrial purposes, it has performed its duty; but the soil, just as the coal mine, has, in consequence, lost a definite portion of its store of wealth.

Apart from the chemists' determinations, the falling off in the soil's fertility can be observed, in the case of land that has been long under cultivation, by the poorer crop yield.

Owing to the patient experimental work of eminent scientists, more particularly those of the last century, this steady decline in the fertility of cultivated land can be arrested by the application of artificial fertilisers.

The practice of fertilising sugar-growing land has become well established in Queensland, and the expenditure on fertilisers is one of the regular items of cost in the production of sugar-cane—a cost, however, that produces a substantial increase in the value of the crop. The price of this commodity has been falling steadily for over a year past, and a further reduction of 35s. per ton in the price of sulphate of ammonia and a consequential reduction in the price of mixed fertilisers has been announced by Messrs. A.C.F. and Shirleys Fertilizers Limited.

It is announced that mixtures and sulphate of ammonia are now lower in price than ever before. It is to be expected that the lower prices will encourage heavier applications to the land, as we are not yet using nearly sufficient to replace the annual wastage of plant food that is removed by the crop and is lost in other ways. Systematic fertilisation plus good farming methods point the road to "more money per acre."

Ray-therapy for Pigs.

Referring to an account of experiments in ray-therapy which have been carried out over a period of three years at a Hertfordshire farm, the "Morning Post" says: "Little pigs have been sent to market four weeks earlier than usual, their lives having been shortened, but at the same time made merrier, by intensive light treatment from tungsten arc lamps. Potential bacon was artificially increased in some cases at the rate of 3 lb. a day."

The report of the experiments states that experiments with ultra-violet rays in connection with farming are being carried on by Mr. J. O. Hickman, at Micklefield Green, Hertfordshire.

Mr. Hickman has also found that ultra-violet rays, applied for a few seconds before milking to the udders of his cows, have greatly reduced the bacteria in the milk. The subsequent irradiation of the milk still further reduced the bacteria content, enabling it to be kept fresh for a much longer period. At the same time it added to it the valuable vitamin D, the anti-rickets vitamin, without destroying the equally valuable vitamin A.

Beef Consumption in the United States Falling Off.

Per capita consumption of beef in the United States was 12 lb. less, while pork consumption was 8 lb. more during 1928 than in 1926, the State and Federal Division of Agricultural Statistics reported recently.

Total meat consumption, which has been steadily declining for years, dropped from 145 lb. per capita in 1926 to 139 in 1927, and 138 lb. in 1928, the report said.

"The yearly kill of beef in 1926 was the largest in history, and it has dropped severely since that year, when the average person ate 63.6 lb. of beef plus 8.2 lb. of veal," the report continued. "Last year beef consumption in the United States was only 51.7 lb. per capita, and veal consumption only reached 6.8 lb.

"Lamb and mutton apparently have become more popular, the amount eaten by each person changing from 5.5 to 5.6 lb. in the last two years, but this still leaves lamb as only 4 per cent. of all meat eaten in America. In England it makes up more than 20 per cent. of the meat diet."

Effect of Lack of Minerals in Stock Foods.

It has been emphasised on many occasions in these columns that in practically every district throughout Australia there is an urgent necessity for the addition of mineral matters to the diet of farm stock, particularly pigs. In the absence of or deficiency in the daily supply of these very necessary additions to the diet of the animals, numerous abnormal conditions are likely to develop, and among these might be mentioned rickets, one of the most frequent and important of the diseases due to mineral deficiency. In this condition, which occurs pricipally in pigs under twelve months of age, the bones, instead of becoming strong, hard, and able to stand the strain of increasing weight, remain soft and comparatively pliable and frequently enlarged at their extremities (the joints). The trouble is more likely to occur where the animals are housed in small, dark, and badly ventilated sties, where, in addition to improper diet, they are not permitted free range or very necessary exercise in the sunshine. Deficiency in the vitamin content of the food exaggerates the condition and exaggerates other evils.

Such animals are, of course, unthrifty and, not being able to stand up to the strain imposed on their bony structure, fall a prey to hog lice, intestinal worms, skin diseases, &c., all of which result in slow and unsatisfactory growth and loss of profit.

Strangely enough, crops grown on soils which are deficient in minerals also suffer in that they are not chemically complete, while the grain and resultant meals prepared from crops grown on these soils are also weak in mineral content. Where in-pig sows are fed on poor country and where their feed is improperly balanced or deficient in chemical content, it is possible they will produce one or more pigs dead at birth, or only half developed, or very weak and puny and unable to fend for themselves. The rickety pigs are weak and are liable to become crippled at the least strain. Pigs suffering from rickets are not as resistant to the more serious diseases as are pigs strong and robust, nor are the sows likely to rear their litters satisfactorily. The only way to overcome these troubles is by cleaning up the surroundings, improving the housing and accommodation, correct feeding, and by the addition to the daily food supply of mineral matters like ground limestone, wood ashes and charcoal, sterilised bone meal.

A suitable mineral mixture may be compounded from the following recipe:—

Salt	20 lb.
Ground limestone	40 lb.
Sterilised bone meal	40 lb.
Ferric oxide	5 lb.
Potassium iodide	3 oz.

This mixture should be carefully prepared, thoroughly mixed, and be placed in a suitable trough protected from the weather and placed in such a position that the pigs can have free access to it at any time. Care and attention and improved methods of management are the only remedies for rickets.

Mr. Chris. Sheehy—An Appreciation.

Thus the "Queensland Producer":—The work of the Secretary of the Council of Agriculture (Mr. Chris. Sheehy) is deserving of special mention. During the past year he has been untiring in his efforts in not only furthering the objectives of the Queensland Producers' Association, but has also done a vast amount of useful work designed to promote the welfare of the producer. Mr. Sheehy has not spared himself in any way, and there is not the least doubt his heart is in his work.

He is a veritable mine of information concerning every detail of the Q.P.A. activities as well as the primary industries of the State and Commonwealth. His task is a very onerous one, but he has brought to it exceptional natural ability and a great capacity for hard work. These, combined with his unfailing courtesy and tact, have contributed much to his outstanding success as secretary of the organisation.

[Mr. Sheehy was formerly a valued officer of the Department of Agriculture and Stock, and in the early days of the organisation was seconded for service as assistant secretary to the Council of Agriculture. On the later reorganisation of that body he was appointed secretary, also secretary of the Queensland Butter Board.—ED., "Q.A.J."]

The Return of the Horse.

The increased number of motor-cars on the road has not banished the horse by any means, and it is cheering to know that horse transport is more than holding its own, despite the increased competition of mechanical transport. It is calculated that there are still over 3,000,000 used for business purposes in the country, over 1,000,000 of which are used in agriculture. The horse has been found to compare very favourably with mechanical transport in cost and maintenance, with the result that many firms and public bodies have rediscovered the value of the horse. We referred recently to the testimony of the railways, and their experience is confirmed by the use of horses by the transport departments of municipal authorities and the larger co-operative societies.—"Live Stock Journal" (England).

Pasture Improvement—A New Zealand Example.

Agriculturists who visited New Zealand could not fail to appreciate the remarkable results achieved there in pasture improvement, stated the Agrostologist of the New South Wales Department of Agriculture in the course of a recent address. It must be remembered, however, that the climatic conditions existing throughout the greater part of New Zealand were of such a nature that no difficulty was experienced in establishing and maintaining succulent pastures of Rye Grass, Cocksfoot, and Perennial Red and White clovers—four of the recognised world's best pasture plants.

Our hot summer weather and more or less uncertain summer rainfall were detrimental to Rye grass, and consequently it was difficult to maintain this grass in a productive state in districts such as the far North Coast, said the speaker, but much could be done with our coastal pastures as they existed to-day in the subdivision of paddocks into smaller areas in order to obtain better control of pasture growth, the application of suitable fertilisers, the use of grass harrows, the scattering and working in on paspalum pastures of seed of the winter grasses and clovers recommended for various districts by the New South Wales Department, and the conversion of surplus pasturage into grass silage or grass hay. Work along these lines was in operation at Berry and Wollongbar Experiment Farms, in addition to smaller trials at representative centres from the Tweed River to the far South Coast.

The main reasons why New Zealand could produce and maintain a supply of sucker lambs suitable for export were:—

1. The excellent pastures available, and climatic conditions which were conducive to the best growth of English grasses and clovers.
2. Sheep of the highest quality were the only types used in the production of export lambs.
3. Freezing works were numerous and were located in the main lamb-producing centres.

Regarding dairy stock, too, one of the most notable features was the excellent standard of animal on the farms.

It had been recognised many years ago in New Zealand that the grading up of the pastures was absolutely essential in order to produce early-maturing lamb or beef and to maintain milking cows in a state of high production. In 1914, 40,000 tons of fertilisers were used for top-dressing pastures, whereas in 1928-29, 315,000 tons were applied to 2,385,182 acres. The area of sown grasses and clovers in the Dominion was over 16,000,000 acres.

In all of the main dairying centres good pasture management was adopted. The subdivision of paddocks into areas of from three to six acres being a special feature of the work. Excess grass growth was controlled by the use of the mowing machine, and the cut material was made into grass silage or grass hay. The aim of the dairy farmer was to have available short nutritious pasturage for the milking cows. The animals always had access to the best feed, and the general practice was to stock at the rate of about twenty cows per acre for about two days, the remaining feed being cleaned up by the followers (generally dry and young stock). The paddocks were then harrowed with special grass harrows to spread the animal droppings and aerate and scarify the surface soil.

The main essential before commencing a system of intensive grazing in the dairying districts of Australia would be to build up reserves of grass silage, maize or sorghum silage, or grass hay as a standby for dry periods and to meet the shortage of feed which generally occurred on pastures in the winter months.

The Newspaper.

"What strikes me more and more about readers is their ingratitude. People grumble at the newspapers, but what would those grumblers do if they could not get their newspapers? I cannot help thinking a lot of nonsense is said about the so-called defects of the Press. I prefer to think of its wonderful achievements, its immense variety, and the wealth of ability bestowed upon it."—Lord Hewart.

Road or Rail—Motors as Feeders to Long-Distance Railways.

Although there are those that believe that eventually the railways will be converted into motor tracks, it is much more likely that under proper organisation the railways eventually will come into their own, as carriers for all long-distance traffic other than that of an exceptional nature, such as goods too bulky to be transported by rail. The problem is one that will be difficult of solution, especially in Australia with its wide spaces.

Commenting upon this subject London "Engineering" says that no arbitrary definition can be given of long distance traffic, but given effective regulation of road undertakings it is probable that, in general, either goods or passengers can be more conveniently and economically carried by rail over distances much in excess of fifty miles. So far as passengers are concerned, greater distances by road tend to become slow and tedious as compared with rail travel. The matter is on a different footing as regards goods traffic, as in this case a balance must be struck between economy and speed. It may be admitted that at the present time, goods can often be carried more than twice the stated distance more cheaply and expeditiously by road than by rail, but, on the whole, the tendency is for the cost of road transport to increase, and that of rail transport to decrease, and we believe that the English railways are now fully alive to the importance of eliminating vexatious delays by speeding up collection and delivery, and the elimination so far as possible of idle time at depots. If we are correct in our surmise, the proper function of road traffic becomes that of acting as a feeder for long-distance rail traffic, and providing local services up to distances of about fifty miles, particularly in the direction of cross-country runs. Such a programme leaves ample scope not only for the existing road carriers, but adequate provision for expansion.

"Big Fleas have Little Fleas——."

How a ruthless war against insect pests in every part of the Empire is being directed from a headquarters in a Buckinghamshire village is described in a report issued recently by the Empire Marketing Board ("The Biological Control of Insect and Plant Pests"). A converted country house at Farnham Royal, near Slough, is used as a clearing station and breeding centre for "beneficial" insects. These are despatched to the Dominions and Colonies to attack their harmful brothers, who cause an enormous annual loss to plant and animal life. The good insects are parasites, and control the bad insects by laying their eggs in or on the pest's grubs and eggs, and then by feeding on them. In the three years of its existence, the "Parasite Zoo," as the laboratory has been called, has been asked by Dominion and Colonial Governments to investigate some seventy different kinds of insect and weed pests in the hopes that parasites might be found.

Damage done by insects is extremely costly. Blowflies, for instance, annually destroy about 5 per cent. of the sheep population of Queensland, and have been estimated to cost Australia £4,000,000 a year. The wheat stem sawfly did £2,500,000 worth of damage in 1926 in one province alone. America suffers so severely that a sum of no less than £2,000,000 was recently spent by the Government in one year in an effort to check the advance of a single insect, the European corn borer. This borer is now advancing into Canada. The United States has recently spent no less than £12,000,000 in fighting five insects.

Shipments of some twenty different kinds of insects have been sent overseas, generally in cold storage, in special cases with food such as raisins, or sugar and water, for rations. Fourteen consignments of a parasite which attacks woolly aphis have been distributed in England, India, and Kenya Colony. This has succeeded in practically exterminating woolly aphis in New Zealand. Parasites of the wheat stem sawfly, the whitefly, and the pine shoot moth have gone to Canada; one which attacks the sheep blowfly has been shipped in large quantities to Australia and South Africa; a Californian ladybird has gone to Madras; a miniature wasp which eats the pear slug has gone to New Zealand, and a bollworm to the Barbadoes. In all, a total of about fifty-eight shipments, comprising some 100,000 specimens, have been shipped from the laboratory to various parts of the Empire.

An Important Factor in Farm Profits.

The farmer generally pays more attention to the price of his products than to the cost of producing them, but the prices of those commodities sold on a world market—wheat, wool, butter—are largely uncontrollable by him, points out Dr. A. E. V. Richardson, in the South Australian "Journal of Agriculture." On the other hand the costs of production, within limitations, are subject to the farmer's control. Various items entering into production costs are virtually fixed; these include taxes, land capital costs, upkeep and certain general expenses. But the major costs of production, excepting only land capital costs, are not fixed—they vary with the intelligence and skill of the farmer, and the power and equipment he applies to them. It is in the preparation of the land, seeding, tillage, cultivation, harvesting and hauling of the crops that the major expenses are incurred, and to the degree to which these can be reduced the profits of the farmer can be increased.

Progress in Empire Buying.

Evidence of the growth of Empire buying in the United Kingdom is contained in the annual report by the Empire Marketing Board.

The purpose of the Empire Marketing Board is clear and definite. It is to improve the quality and increase the quantity of Empire products marketed in the United Kingdom and to make Empire buying a national habit. From this centre radiate all the diverse activities of the Board. The scientist at his laboratory table serves its central purpose no less than does the salesman at his shop counter.

No amount of persuasion brought to bear upon the consuming public in all its forms would succeed unless it was supported by the wholesale and retail traders. The Board has accordingly endeavoured to secure the fullest co-operation of all kinds of traders concerned with Empire marketing.

The year has seen a steady extension, on the marketing side, of the services provided by the Board. The rise of the "National Mark" as a factor of prime importance in placing home-grown foodstuffs on an orderly marketing basis has been actively assisted by the Board. The direct initiative and responsibility for the "National Mark," as for all schemes for improving the condition of agriculture in the United Kingdom, falls, of course, on the Ministry of Agriculture and the Scottish Department of Agriculture. The Board has co-operated with these departments by providing the necessary funds, as well as by advertisement and other channels of publicity. In all its activities the Board has continued to put first the interest of the home producer.

Cultivating the Fallow—The Implements to Use.

The implements that should be used in working the fallow depend very much on the nature of the soil and the state of the fallow. If the soil is medium to heavy loam and is free from weeds the harrows or springtooth cultivator would serve. If semi-alluvial brown loam, light red loam, or heavy black self-mulching soil, and free from weeds, the harrow would be the most suitable implement. If heavy red loam or clay country, or if weeds are prevalent, the rigid tine scarifier should be used. The determining factor is usually the amount of weed growth. It is often possible to deal very effectively with weeds when very young by the use of the harrows, but should weather conditions and other factors delay the working until the weeds are too big, the rigid tine cultivator with suitable points will put the fallows in excellent condition.

The rigid tine cultivator or scarifier is the most satisfactory implement for most classes of soil. Compared with the springtooth—because it can be set to the desired depth—it does much more uniform work, makes a more even mulch, and leaves the top of the compacted subsurface area level, not ridged. This makes for a much more uniform condition of the fallow generally, and results in a more even crop. With the correct points, or fitted with knife bars, it can deal much more effectively with weed growth, particularly thistles and melons; it has not, however, the sifting action of the springtooth, and should not displace it for the early cultivations.

The disc cultivator is without doubt the best implement of all to put the fallow in bad condition. Admitting its value in destroying large weeds, it is evident that these could almost always have been killed while quite small by the use of other implements. Large weeds are a sign of a neglected fallow. Deep discing ruins the compacted sub-surface layer, delivering the clods to the bottom and fine soil to the surface, where it is easily crusted by the first rains. As discing is usually carried out in January or February, not only is the whole physical condition of the fallows practically ruined, but rapid evaporation of moisture results, and there is not sufficient time to restore consolidation unless special means are devised, and they very rarely are.—A. and P. Notes, N.S.W. Dept. Agric.

Why the Boy Leaves the Farm.

Why did you leave the farm, my lad? Why did you bolt, and quit your dad? Why did you beat it off to town and turn your poor old father down? Thinkers of platform, pulpit, press, are wallowing in deep distress; they seek to know the hidden cause why farmer boys desert their pa's. Some say they love to get a taste of faster life and social waste. Some say the silly little chumps mistake the suitcase cards for trumps, in wagering fresh and germless air against the smoky thoroughfare. We've all agreed the farm's the place, so free your mind, and state the case.

Well, stranger, since you've been so frank, I'll roll aside the hazy bank, the misty cloud of theories, and show you where the trouble lies. I left my dad, his farm, his plough, because my calf became his cow. I left my dad, 'twas wrong, of course, because my colt became his horse. I left my dad to sow and reap because my lamb became his sheep. I dropped my hoe, and stuck my fork, because my pig became his pork. The garden truck that I made grow, 'twas his to sell and mine to grow. It's not the smoke in the atmosphere nor the taste of life that brought me here. Please tell the platform, pulpit, press, no fear of toil or love of dress is drawing off the farmer lads, but just the methods of their dads.—From an American journal.

Cultivation of the Fallow—Importance of Spring Workings.

Fallowed land contains its maximum amount of moisture in the spring, but evaporative agencies become increasingly active from this period onward, and if cultivation of the surface is neglected a steady loss of the stored moisture will take place.

In experiments at Longerenong Experiment Farm, Victoria, the moisture content of a worked and a neglected fallow was carefully ascertained at different depths every month. Certain land was ploughed and cultivated in September, one portion receiving no further cultivation, and the other being worked in the same way and at the same time as other fallow land in the vicinity. On 1st November there was already a difference in the moisture content, and by April the difference was marked, the neglected fallow having in the first 4 feet 27.16 per cent. of moisture, while the cultivated fallow had 32.71 per cent. As February and March were months of good rainfall, the difference in the top 4 feet was not as great as it would have been in a dry summer, but further tests showed that the rains referred to had gone a good deal deeper than 4 feet in the cultivated portion, and remained there to nurture the succeeding crop. Californian investigators found that while in uncultivated land there was 4.3 per cent. of moisture in the first foot of soil, in cultivated land there was 6.4 per cent., and continuing their experiments at every foot to 6 feet below the surface, they showed that the advantage was the same almost the whole way down.

Weeds also, of course, play their part in depleting a neglected fallow of moisture. They rob the soil also of plantfood, and spread their seeds to the detriment of the next crop.

Provided the soil has been ploughed when in good condition, it can with advantage be left some weeks in the rough state as broken by the plough. Recently ploughed land is covered with the most effective mulch possible, and even if the surface becomes somewhat caked, little is gained by working it in the winter. In this rough state, too, it readily absorbs moisture, permitting rain to penetrate into the subsoil, and loss of moisture by run-off is reduced to a minimum under these conditions. Moreover, a greater surface of soil is exposed to weathering agencies such as frost, air, and sun, which have a mellowing influence on the soil. As the soil begins to dry up in the early spring, however, it is necessary to break the surface to renew the mulch and begin the preparation of the seed-bed.

The actual amount of working the fallowed land will require will depend upon the climate and the condition of the soil. If the moisture is to be conserved, the soil must be stirred as soon as the effectiveness of the mulch is destroyed by rain; mulches are only effective when loose and dry. Even a light shower is sufficient, under some conditions, to render a mulch ineffective; and when this is the case the soil is often drier twenty-four hours after the shower than if no rain had fallen. This is due to the increased capillarity of the particles, caused by the wetting and consequent compacting of the soil, resulting in loss of subsoil moisture by evaporation.

Two things have to be kept in mind in the working of the fallow through the summer: first, the preservation of an effective surface mulch, and second, the preparation of a seed-bed that will afford the most favourable conditions for the germination of the seed and the growth of the crop. The actual manner of the cultivation of the surface, and the implements to be used for the purpose, differ considerably. On the great bulk of the soils in our wheat areas, especially on those

that tend to break up readily, the practice preferred by many farmers is to work the fallow first with the harrows and then with the springtooth cultivator to the full depth of the original ploughing. The effect is to bring the clods in the worked soil to the surface, while the fine soil is sifted to the bottom, forming a layer of a couple of inches of finely divided soil which readily becomes compacted and united with the subsoil.

By enabling the cultivation to be completed in a minimum of time, wide stretches of harrows are very useful for the first cultivation of the fallow in the early spring, when delay for only a few days may result in a very serious loss of soil moisture. They also prepare and pulverise the soil for the subsequent working with the cultivator.

On some of the heavier soils harrowing is sometimes advisable after ploughing, for if not worked down somewhat during the winter, while still moist, the clods are very hard to deal with later; they become dry and hard in the summer, and none of the ordinary implements are capable of breaking them down to smaller sizes. If such soils are harrowed down soon after ploughing many of the clods will be considerably reduced in size. When the soil is infested with the seeds of the wild oats it is an advantage to harrow after ploughing in order to encourage the early germination of the oat seeds.

On soils that set after rain and on which it is desired to maintain a cloddy mulch, it is not advisable to harrow after ploughing, as this practice helps to make the surface too fine without improving the condition of the soil below the surface.—A. and P. Notes, New South Wales Department of Agriculture.

Herd Testing as an Aid to More Profitable Dairying.

The main object of herd testing was to find out the cows that were not profitable, and by breeding, feeding, and culling to increase the average production of the herd, explained Mr. E. P. Filmer, at a recent gathering of New South Wales farmers. The average yield per cow for the State was 150 lb. of butter per annum, yet there were some herds which were doubling that yield and many others which were over the 200-lb. mark. This simply went to show the great number of cows that should have no place in the dairy herds, and which were not showing their owners a profit.

Describing the development of the herd-testing movement in his own (the Candelo) district, Mr. Filmer said that in 1921 he and the manager had gone exhaustively into the average production of cows milked to supply the factory. They found this to be about 115 lb.—at most not more than 120 lb.—of butter per cow per annum, and this fact had stirred some of them to form a unit in connection with the factory. After eight or nine years' continuous testing he had been enabled to increase the average yield per cow in his own herd from 180 lb. to just on 250 lb. of butter per annum, and this with a herd ranging from 95 to 100 head. On looking over his last twelve months' test records he found the best cows made 519 lb. of butter, five over 400 lb., thirty-two over 300 lb., sixty-two over 250 lb., and ninety over 200 lb. For the period 1927-28, the best cow made 415 lb., thirty-seven over 300 lb., sixty over 250 lb., and eighty-one over 200 lb.

Herd testing had everything to commend it to the dairy farmer as a good business proposition and it also made the work much more interesting. But many disappointments awaited the beginner. The cow he thought the best in the yard, if not in the district, might be found to be unprofitable, and the one thought hardly worth keeping might be "carrying the favourite on her back."

It was not advisable to sell or cull out on one test. It was advisable to go on for a number of years. He would advise setting a standard and then gradually raising it. They would find that some cows did extra well for two or three months under favourable conditions and then went off; others did not do so well at first, but they were consistent producers to within two or three months of next calving, and when their production was totalled they were much ahead of the big yielder of a month or two. Hence the necessity for testing over a period. In his opinion testing should be continuous—it was unwise to test for a year and then leave off. They were constantly getting fresh milkers in the yard either by purchase or breeding.

The dairyman who had, say, from 80 to 100 cows, and who wanted stock as much as butter, might be able to do without testing, but the man who had, say, forty cows could not afford to keep "boarders." Testing was vital to him—it meant the difference between success and failure. If a farmer had a herd of, say, forty, and each was producing 175 lb. of butter per annum and he raised this to 250 lb. per annum, which was quite possible, it meant an increase of 3,000 lb. of butter, which at 1s. 3d. per lb. amounted to £187 10s., an amount that would more than pay the interest on an overdraft of £2,500 at 7 per cent.

There was another aspect also, for when the farmer knew his cows' production he was not in the dark when selecting his own heifers to carry on with, for the old saying that "like produces like" was true, especially when the farmer was wise in the selection of the sire.

In many cases it had been the practice to get rid of cows at from 8 to 10 years old, their owners contending they were unprofitable, but he could not agree with that. They had in their herd a few cows that were first tested in 1919, and were still profitable, as during the last testing period they had made up to 300 lb. of butter. It was also advisable to get as many heifers as possible from an extra good producer, even to the extent of keeping her longer than usual.

The figures presented by Mr. Filmer showed that the factory's production had steadily increased from 363,516 lb. to 540,214 lb. during the four years 1926-29, despite the fact that there were upwards of 200 cows fewer than in 1926. That increase, he said, had been largely due to the improvement in the herds that had come about through testing.

The Importance of Pedigree.

It is a matter of some surprise (writes a correspondent to the "Livestock Journal," England) that there are still men claiming to be stock-breeders who do not realise the value of pedigree—men to whom it is necessary to explain the meaning of pedigree. A stockman replied to a question of mine the other day that he "would breed a good beast without pedigree." Undoubtedly he could, but he could never succeed ultimately so well without pedigree as he could with it. As a matter of fact, a good sound non-pedigree herd is the best foundation one can have upon which to use a good pedigree bull for the improvement of the commercial stock. Still, one should aim higher than that. It is not possible to raise up a pedigree herd without a pedigree foundation. To improve commercial stock by using a pedigree bull is one thing. The use of the right kind of bull will do all that one can hope for in that direction. Starting a pedigree herd means using pedigree females as well as pedigree males.

The value of pedigree is that it enables one to know more definitely beforehand what to expect in the progeny. With pedigree one knows the kind of animal being bred from, but without it one does not. The family tree might be a long one or a short one, but, providing it has been a successful one, it helps by enabling the breeder to take his aim beforehand. Without entering into a discussion of the technique of breeding, it may be said that the successful pedigree animal is the one that, besides having a good pedigree, carries all the characteristics of the breed in colour, size, conformation, and physical ability. Without these last-named qualities pedigree is not of much use in an animal. On the other hand, pedigree denotes ability to carry these qualities, prepotency to perpetuate all the desirable qualities of the breed.

I mention these points because there has been a good deal said during recent years on the desirability of improving commercial stock by a more extended use of pedigree bulls, and many people have come to regard this as sufficient effort. But it cannot be too clearly emphasised that the mere use of a pedigree bull, though good and valuable in itself, is not pedigree stock-breeding. The point which the intelligent farmer often has to decide is whether he will go on merely improving his commercial herd by this means or whether he will embark upon pedigree breeding. It is then that a consideration of the value of pedigree comes in. What is pedigree in practice and what is its value?

We are all agreed that the use of a pedigree bull will improve a commercial herd. A pedigree herd enables us to contain in that herd those desirable qualities which when used on non-pedigree animals improves their quality. We ourselves breed those qualities we so much want. The value of pedigree consists first of the power which its use puts into our hands for retaining and using all the best qualities of a breed and, secondly, of the means which it provides for enabling us to build up to an ideal in breeding so that we may further improve on the quality of the breed and breed out undesirable points.

There are very few really successful pedigree breeders; and that is why we are obliged to go to someone else to improve our herd and why we are willing to pay the price.

In conclusion, it may be said for the benefit of those contemplating pedigree breeding or of changing their methods, that there is a cash value to pedigree. Pedigree in an animal, no matter when he is disposed of, is of some cash value over and above its ordinary commercial value. To some this may sound a small point, but really it is a very important one, and we shall do well not to lose sight of it, especially in its full application to the value of a herd.

Fecundity of Berkshires.

The statement that "Berkshires do not farrow enough pigs," has been challenged by the Berkshire breeders of America.

Attention has been turned to the statistics as contained in the first 1,400 litters in volume 63 of the "American Berkshire Record." The 1,400 litters showed a total of 12,309 pigs farrowed, or an average of 8.792 pigs to the litter.

Of the 12,309 pigs farrowed in these 1,400 litters, 9,803 of them were reared. This makes an average of 7.002 pigs reared per litter.

A summary of the 1,400 litters shows—

9 litters of 3 pigs each	130 litters of 11 pigs each
19 litters of 4 pigs each	61 litters of 12 pigs each
46 litters of 5 pigs each	42 litters of 13 pigs each
99 litters of 6 pigs each	12 litters of 14 pigs each
177 litters of 7 pigs each	11 litters of 15 pigs each
282 litters of 8 pigs each	2 litters of 16 pigs each
294 litters of 9 pigs each	1 litter of 17 pigs.
215 litters of 10 pigs each	

Pasture Improvement—A Southern Farmer's Experience.

Mr. F. J. Smith, of Bombala, New South Wales, has experienced considerable success in connection with the top-dressing of the natural pastures on his property, as well as with the sowing of introduced grasses and lucerne.

The benefits derived from superphosphate on oats and lucerne convinced him that the use of fertiliser was a payable proposition, and he decided about six years ago to test the value of superphosphate on the most important (from the grazier's point of view) of all crops—grass.

He selected 40 acres of natural pasture which had a carrying capacity of one and a quarter sheep to the acre, and applied the superphosphate in March at the rate of 1 cwt. per acre. The immediate results were not spectacular, but clover and trefoil gradually made an appearance, and greatly added to the quality of the pasture, as well as the bulk of feed available, until to-day Mr. Smith estimates that the carrying capacity is two and a-half sheep to the acre—just double what it was six years ago. Although he found that the wool of sheep on top-dressed pasture coarsened up somewhat, still the increased weight of the fleece more than made up for any loss in that respect. Moreover, there was an added advantage in that the animals depastured on the top-dressed area were far healthier and comparatively free from internal parasites.

The estimated cost of top-dressing was only about 7s. 6d. an acre in this case, and as the benefit of the application is noticeable for about three years, the cost can fairly be reckoned as spread over that time.

Mr. Smith has had even greater success with the sowing of grasses for the improvement of his pastures. On one paddock, of five sheep-to-the-acre country, he sowed Subterranean clover seed at the rate of 4 lb. per acre, along with superphosphate at 1 cwt. per acre. The increase in carrying capacity has been phenomenal. For the past five years the paddock has averaged four sheep to the acre, while at times it has carried up to nine sheep to the acre. At a cost of 2s. per lb. for the clover seed and 7s. 6d. per cwt. for superphosphate, Mr. Smith, naturally, is convinced that the expense has been well worth while.

On another area he sowed a mixed pasture of Wimmera Rye grass, Cocksfoot, Giant Fescue, Subterranean clover, and lucerne. The ordinary manure spreader was used for sowing the seed, with which had been mixed superphosphate at the rate of 75 lb. per acre. While this land was previously only capable of carrying 1¼ sheep to the acre, it has since carried as many as eight sheep per acre for as long as eight months of the year, and during that time six tons of grass hay had been cut and stacked.

The wisdom of sowing lucerne in a permanent pasture has also been amply demonstrated on this Bombala property, although Mr. Smith confesses that his first efforts to establish lucerne were somewhat unsatisfactory until he decided to top-dress with superphosphate. The success is just another link in the chain of evidence in support of the claim that practically the only place where lucerne will not grow is where it has not been sown.

In the face of such convincing evidence it is very difficult to understand why it is that top-dressing and pasture improvements work generally are not more widely practised. The expense is not great, the returns are considerable, and by making an acre support two sheep (or more) which previously only carried one, such improvement suggests itself as a ready means of cheapening production.

Why Not Hard Work?

"During the war it was shown what an enormous productive activity a people is capable of developing compared with ordinary times," writes "Scrutator" in the "Scottish Bankers' Magazine." "Everyone then vied with his neighbour to help to make two blades of grass grow where one grew before. Since the end of the war the process has been practically entirely reversed.

"Nearly everyone has vied with his neighbour in indulging in an orgy of extravagance and waste. The figures already given surely demonstrate that beyond question. Practically everyone to a greater or lesser extent in every class of the community is involved in responsibility, and it is useless for anyone to try 'to compound for sins they are inclined to do by damning those they have no mind to.' The economic war with unemployment can be won in no other way than the war was won.

"Let us reverse our spendthrift habits and throw all our resources of money and physical power into the reproductive and fructifying channels of productive industry, thus increasing and cheapening the necessaries of life, creating demand for them, and turning the vicious circle of the dole and extravagance and waste into the healthy channel of supply and demand of the necessaries of life. Is it a counsel of perfection? It will need all the determination and self-denial by every class shown in the war, but it will be no less successful than it was in war-time."

No Room for Bad Cattle.

What one notices at sales everywhere is that cattle of good quality always sell at a profit. It is the second-class qualities that are the drag on the market, not only failing to make a profit themselves, but depressing trade for the best stuff. One is amazed at the number of cattle of second and even third class quality to be found on the markets. But they are known and the trade for them is bad.

Why do breeders not eliminate this class of stock altogether? This stock not only keeps down the average prices for all qualities, but is a danger in itself. Some of the cattle get passed off, and although a grazier is usually a good judge it is no unusual thing for him to be saddled with inferior animals. Now, it should be remembered that the grazier does not often have much of a good time, and to find his purchases including a few wretched scrubs means that a fine hole is eaten into his profits. This year the grazier is having to pay dearly for his stock. We hope that prices all round will be maintained at a sufficiently high level over a sufficiently long time for him to make his profits.

The grazier and the feeder, much more than the rearer, know their markets. They know the class of stock they must put on the market to sell. Therefore they know what they want to buy. The rearer should be able to supply their needs, and would be able to do so if he would take a little more trouble in buying stock of quality to rear, or in breeding it, as the case may be.

Most of the bad cattle stock in the country is a result of bad breeding. This breeding could be improved, and quickly so, by banning the use of the scrub bull. Many farmers are still under a delusion as to the value of pedigree in the sire, for they think that a beast is a beast, and that if he has good grazing and good feeding he will be all right. But he never will. No amount of care in feeding or other management ever made a badly-bred beast into a good one. There is only one remedy. Keep off the bad bull, and do not buy calves or young stock because they are cheap unless the breeding is good as well. At the moment, with better qualities so dear, there is a temptation to fall back on poor quality because it costs less money. Let those who do this remember that when the market begins to fall the worst stock goes first, and that if money has to be lost over cattle it is the cheap ones—the poor quality ones—that lose most.

There is still much hesitancy, and even silly talk, among farmers on the scrub bull question, but he will have to go, and the sooner all stockmen reconcile themselves to this fact and prepare to conform to reasonable regulations in the matter the better it will be for the stability of British trade. We see the benefits of well-bred cattle, no matter what state the trade is in. Good-bred cattle pay when trade is moderate, when it is bad they keep things together better than poor ones, and in good times they really pay their owners.

In general terms the same remarks apply to sheep, but these, of course, are very dear, and the difficulty in regard to breeding is not quite so great as with cattle. Sheep breeders are a class to themselves, and manage to turn out good stuff. Farmers who are not sheep specialists also seem to recognise the value of a good tup, or a good stallion among horses, more than they do a good bull. Why this should be so is difficult to say, but it seems to be a fact. Still, even with sheep it is quality that

tells. And to-day when sheep are really difficult to buy, we find people who think they will try their hand at the job, starting with just the wrong kind of stock, because this happens to be a little cheaper in each outlay than the best.

Among cattle and sheep the tale is the same. Breed the best and you are sure of a market. Pigs, too, come into the same category, though the position is rather different owing to the liability to rapid soarings and slumps in the trade. But even here quality will out. Especially if it is of the sizable bacon and not too fat kind which the provision merchants can sell so well, and which the curers like to supply. At this time, when stock prices are high, it is well to be on guard against the temptation to indulge in cheap stock, whether cattle, sheep, or pigs.—L. M. Marshall, in the "Live Stock Journal" (England).

Founding a Herd.

Laying the foundation of a herd is a matter to which considerable thought and trouble should be devoted. To the real progressive breeder there is always a goal not yet reached, a perfection not quite attained, more and more desirable characteristics to be bred into the cattle, the expectancy of a mating to be fulfilled, a business that becomes more intensely interesting.

A beginning must be made before there can be any progress. Some will say to buy only the best and mate with the best, but if this were the only way Shorthorn herds would not be as popular as they are. Experience is one of the most necessary requirements and, like learning to swim, the way to learn is to get in. Like many other trades, there is much to learn, and the more one does the more experience and, consequently, the more knowledge. Comparison is a great help, and among several head one is soon finding there are some that have not fulfilled his expectations, and we wonder why, and try to find out if we are real breeders.

We ask some older breeder or herdsman all about the ancestry of our cow and her good points and faults. Then we either conclude that she is not worth bothering about as a breeding proposition or that she needs mating with a more typy and more thickly-fleshed bull. As a better bull will help on all the cows, a bull that nearer meets our new ideal is purchased. The cow is also sold, and with her faults in mind, a better one is purchased. In the new crop of calves we note the improvement, and are pleased.

Now, about this time we find that a neighbour breeder has a cow or two with qualities that we had not been able to see before, and that still another breeder has his cattle in much better flesh than ours. Now, we have known that he takes good care of his cattle and feeds them well, but we were doing all we knew how to do for our own. On asking a friendly breeder who has been successful, we are told that we should have a good feeder or herdsman. Following his advice, a herdsman is added, and if he is one old in experience we soon find out how little we knew, and also have defects pointed out to us we had never seen and knew but little about.

As we go over the breeding of the cows with this man and he tells us of the good and bad things in their ancestry back several generations, and which are cropping out in our calf crop it is then we begin to realise what is meant by a good herd bull, and also how bad we have been needing this herdsman with his wide experience. In fact, the herd-building job begins to look too large for us, and we are half discouraged. But on looking over the situation we find that we are well in advance of many breeders, and doing as well as others and better than many, so we decide to stick and to add a few better breeding cows that more nearly approach our new ideal. We will watch the successful breeders more closely, and watch our chance to put in a breeding bull that is a credit to any herd.

This in time is all done, and we find that we are producing cattle that compare favourably with the good breeders of the country, and it is only a few years since we bought our start. We have grown to like our cattle, and to know them intimately as individuals, as the good or bad of their ancestry is tucked away somewhere in our mind. We figure a year ahead just the proper mating for a certain cow, and speculate on the coming calf, and wonder if any of the defects of its grandparents will be apparent, and rather hope the strong points of the new bull will overcome them.

We have met many strong-minded men who are the foremost men of the nation in their business. We have competed with them, and it has brought out all the generalship there was in us. We have broadened our minds. We have travelled and are acquainted with our own country. We are identified with the people that do things. It is an advantage to our children. We feel that we are on the right road, and that in time we will produce cattle that will be a benefit to future generations. What an interesting and profitable art is herd building, and we begin to realise there is no limit to its success—"The Livestock Journal" (England).

An Irish Litter Record.

In a recent issue of the "Weekly Irish Times" reference is made to the prolificacy of Irish breeding sows. One of these sows, owned by Mr. P. Kennedy, Mountloftus, Goresbridge, had a litter recently of twenty-one strong, healthy pigs. This was considered to be a record in County Kilkenny.

The Real Function of Licks.

The real function of licks, writes the Chief Veterinary Surgeon of the New South Wales Department of Agriculture, lies in providing mineral matter which is lacking in the soil. Frequent attempts have been made to advocate their use on purely medicinal grounds, but most of the claims so made will barely stand inspection. There appears to be no evidence, for instance, that they can be utilised in the prevention of any specific disease, though doubtless where they are used to balance a mineral deficiency they will increase the general power of resisting disease. At times various ingredients which are of no value as food and do not supply any mineral deficiency are included. As examples may be quoted gentian, aniseed, and foemyrec. These are all mild stomach stimulants and carminatives, but the average sheep has a perfectly good appetite which seldom requires stimulating. As agents in the treatment of sick animals they have their place, but not as regular feeding materials to perfectly normal stock.

Denmark's Agricultural Advance.

How Denmark has advanced in the world of agriculture during the last fifty years was pointed out by the President (Mr. Henry Smalley) at the luncheon at Blackburn, Mellor and District Show (England) recently. It had not been done by lower wages, he said, for in Copenhagen wages were from 5 to 10 per cent. higher than in London. Before 1880 Denmark was poor, and had an ignorant agricultural population with very inferior cattle and an apparently small export of dairy produce. In 1928 they exported £66,000,000 worth of agricultural produce, which was £19 per head of her population. Since 1880 she had increased her export of butter nine times, bacon thirty-five times, and eggs thirteen times, and now she exported one-third of the whole of the butter exported in the world, one-quarter of the bacon, and one-tenth of the eggs. How had it been done? By greatly improved education and intensive cultivation. The productivity of the land in Denmark had been increased by 75 to 90 per cent. in the fifty years, and there was a smallholder cultivating ownership of 90 per cent. of the land.

"Music Soothes ——." Broadcasting for Cows.

Mr. A. H. McLean, a farmer of Hauraki Plains, Auckland, New Zealand, claims that there is a marked increase in the production of milk from his cows as the result of providing his herd with wireless music. In proof of his assertion, he can show a drop in factory weights for every Tuesday morning, corresponding to the Auckland broadcasting station's silent day on Monday. Mr. McLean also states that his cows stand quietly as long as the music is coming over, and that they come in to be milked of their own accord when they hear the music commence. It has long been known that cows are fond of music, and some American farmers provide it for them.

It is frequently claimed that milkers who sing at their work get better results than others, but that is usually attributed to the fact that milkers who sing must be in a good humour, and thus treat the cows gently.

Marketing Citrus Fruit—Californian Methods.

Interesting reference to Californian methods of preparing citrus fruit for market is made by Mr. J. W. Blick, of the Producers' Co-operative Distributing Company, Limited, Sydney, in a recent report on the prospects for the marketing of Australian fruits overseas.

The care with which the fruit is handled in the packing sheds with a view to obviating the possibility of the skin being in any way bruised is most striking, it is stated. The same care is exercised in the picking, handling, and transfer of the fruit from the trees to the shed. Before being graded and sized, lemons are washed and brushed for ten minutes in soft soap and water at a temperature of 115 deg. Fahr., and then immersed for five minutes in a bath of bluestone and water at a temperature of 110 deg. Oranges are treated by being first put over the brushes, and then for twelve minutes travelled through a bath of warm water impregnated with a cleanser, the temperature of the solution being 110 deg. Fahr. They are then sprayed with cold water and subsequently dried as they travel over

rollers on their way to the grading tables. By a simple contrivance the word "Sunkist" is stamped on each orange or lemon entering the grader. Although this process is a simple one and involves no extra work on the part of any of the staff and but a small outlay for the appliance, it has done a wonderful lot to popularise the "Sunkist" pack in all parts of the world, for the fruit retains its identity through all trading transactions right into the hands of the consumer.

Coloured wraps are universally used; they improve the appearance of the fruit in the cases, while the attractive labels stand out boldy on the ends of the cases.

Mr. Blick is of the opinion that Canada is a potential market for our citrus fruit (Valencia late oranges, arriving in October or November), and substantial extension should also be possible in the East. To develop trade in those parts of the world, however, it is necessary that Californian methods and packages, including the continuous supply of large quantities of fruit under a common brand, be adopted. These methods in packing and marketing oranges have practically set a standard all over the world, and Australian progress will be simpler and extension more rapid if they are adopted than if we set up standards of our own and have to convince oversea traders that these, together with our fruit, are of equal if not better value than their purchases from U.S.A.

Improving the Dairy Herd.

The bull is a potent factor in the improvement of the herd, but it is not enough that he should be pure-bred and that he should show the points of his breed—he should be of a productive family too. It is sometimes contended that his selection according to his capacity to endow his daughters with the power of high milk production is the only reliable method, but this involves keeping the bull for several years instead of for two or three, which few farmers can do, as it means in practice keeping more than one bull on the farm. An effort should be made, however, to trade bulls in such a way that their whereabouts may be known, for while many bulls are well got rid of, others would be worth a good deal to get back. Whatever its breed, the bull should be of a vigorous, masculine type, capable of transmitting his characteristics to his offspring. Constitution should be indicated by a capacious chest, much width through the region of the heart, a bright, full eye, round barrel, and well-sprung ribs. The skin should be soft and pliable, the neck should carry a good deal of crest, and there should be nothing coarse or flat over the shoulders. The carriage should be active and the manner alert, though the temper must be equable. The placing of the teats in a calf generally follows closely that of the rudimentary teats in the bull, hence a sire should not be purchased in which they are not properly placed. If they are bunched together the animal is certainly not a desirable one. Lack of constitution is indicated by a dull, sunken eye, a long, thin neck, flat ribs, long legs, cramped lung and heart space, harsh skin, and staring coat.

Similarly, quite apart from the qualities of her breed, the cow to be bred from should show femininity and constitution. A distinctly feminine appearance is an indication of activity of the sexual organs. Constitution is denoted by a broad chest, giving ample lung capacity, and a large girth, affording plenty of room for the heart. The barrel should be both deep and long, as there is then plenty of room for the digestion of large quantities of feed. The eye, again, must be full and prominent, the carriage active, the skin loose and soft, the horns and hoofs fine. In form a dairy cow should be wedge-shaped, light in front and heavier behind, and the pelvis broad. The best milkers have invariably a well-shaped udder, and large and tortuous milk veins that extend all over the udder and away from it. Good milkers are generally spare in flesh. Cows that do not produce, say, 160 lb. of butter-fat in a lactation period of 273 days should not be mated, but should be dried off, fattened, and sold. None of the foregoing points must be regarded individually as infallible signs of heavy production—what must be looked for is a combination of them all.

Judgment is necessary in mating sire and dam. In some measure the deficiencies of one may be rectified by the qualities of the other, but this is only true in a measure and only of certain characters. There is no assurance, for instance, that lack of constitution in one animal is likely to be compensated for by the other. The defective animal should be rejected altogether if there is not to be a risk of the progeny proving a "scrub."

Temperamental differences must be taken into account; two highly nervous animals are not likely to be mated to advantage. Relationships must also be watched; if blood connection exists it may be inadvisable to mate the animals.

Feeding is also an important factor in mating cattle. Insufficient and too ample feeding of the animals to be mated must both be avoided.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

LEAD POISONING.

Just step on to your veranda and rub your hands hard on the veranda rails. If a powdery substance sticks on your hands, make sure that the paint is non-poisonous. For if not, your house is a death-trap for children.

Lead paint is known to be poisonous all over the world. But lead-poisoning on a considerable scale affecting children only has been reported only from Queensland. Why should this be? The answer is not difficult. For good reasons most of us live in houses built of wood. For convenience in building and for protection against white-ants houses are built on high stumps. The verandas, which are so necessary in this climate, must therefore be protected by rails, and to look well these rails must be painted. Wooden surfaces coated with lead-paint are harmless so long as the paint adheres firmly. They are dangerous (1) while the paint is still moist and sticky, (2) when the paint is loose and powdery. Paint on surfaces outside the house exposed to the weather usually becomes powdery within two or three years. Anyone who has observed little children clinging to the rails of a veranda, and who knows how often their fingers go into their mouths, will understand easily how they get poisoned. It is not only from veranda railings that they get poisoned; painted gates and fences are equally dangerous. Older children sometimes get poisoned in the same way. On inquiry it will usually be found that they have the habit of biting their nails.

Signs and Symtoms.

This is a slow form of poisoning. Lead gradually accumulates in the body, and it may be some time before the child gets ill. Usually the first sign is griping or colic, often called stomach-ache. Of course, colic may be caused by over-eating or indigestible food. But lead-colic has no relationship to food. It may persist at intervals, especially during the night for several days or a week although the child is eating scarcely anything, and perhaps vomiting most of what he does eat. Then rather suddenly the pain stops, and the child eats anything and everything until his next attack, which probably occurs within a few weeks, and is perhaps accompanied by pain also in his legs. If the disease progresses, the next thing noticed is a weakness in the legs. The child walks badly, his legs may give way suddenly, his toes drop so that the foot has to be raised high, and even then his toes barely clear the ground, so that he trips easily. Both legs are equally affected, and you should now know that your child has got chronic lead-poisoning fully established. It will take three months or more for him to recover if he is removed from the source of the poison. If he is not removed, he may be a cripple for life. If he recovers and returns to the poison he will have a second attack, and this will be worse than the first.

Other and more Dangerous Forms.

But lead-poisoning takes other forms sometimes, more acute and still more dangerous. At the very beginning or at any time during the illness the child may have an attack of convulsions. Now convulsions may be due to many causes, the most common being over-eating of fruits, cakes, or sweets; another common cause is high fever coming on suddenly. But convulsions from lead-poisoning are unusually severe and not infrequently fatal. If the convulsions occur easily in lead-poisoning it is very probable that their cause will never be suspected.

The Sad Effect.

The most sad effect of lead-poisoning in children is complete and incurable blindness due to destruction of the optic nerve. These cases are not so common—they usually have had no previous signs of lead-poisoning or none that have been noticed—and consequently they may not be recognised until too late. If recognised, early blindness can always be prevented; after it has been established, no treatment will restore sight. Fortunately there is one symptom that is nearly always present at the beginning of the attack, and that is the development of a squint. This has nothing to do with the common cause of squint, which may be cured by wearing glasses. If your child has a headache and develops at the same time a squint, which he did not have before, get medical advice immediately. He may be suffering from the form of lead-poisoning that attacks the eyes, and prompt treatment may save his sight.

Unfortunately lead-poisoning has remote consequences that are extremely grave by its action on the kidneys. Kidney disease has many causes, and among them is lead-poisoning in childhood. These children may have recovered from their early symptoms but their kidneys may be left defective. Not exactly ill, but never really strong, they survive only to die in their teens or early twenties, usually rather suddenly and unexpectedly.

A Good Law Plus Enlightened Public Opinion.

There is a law in Queensland forbidding the use of lead paint on outside surfaces within the reach of children's hands. Whether this law is effective depends on the existence of public opinion in favour of strict enforcement. Surely we should protect our children.

THE FARM HOME.

PURITY OF FOODSTUFFS—SOME SIMPLE TESTS.

Thanks to the efforts of the authorities that are responsible for the purity of our foodstuffs, the adulteration of commodities is not so common as in the past, says the "Journal of Food Industry," London. Unfortunately, however, impure foods are still on the market. The following tests will enable buyers to determine if the foods they are receiving are pure or otherwise.

The expert coffee taster can tell by simply tasting the beverage if chicory has been added, but to the ordinary consumer this would not mean much. An infallible test is to place a teaspoonfull of the dry coffee in a tumblerful of cold water, stir well with a spoon, and leave for a minute or so. If the water remains clear the coffee is pure, but if it takes on a brownish tint chicory has been added. The darker the brown tint the greater the amount of chicory that has been added.

To test the quality of sugar, burn a sample in an aluminium spoon over a gas jet. If the sugar burns away entirely it is pure, but if any ash remains adulterations have been added.

The best way to test olive oil is to pour a quantity into a small bottle, add an eighth of the quantity of household ammonia, and shake well. If the mixture assumes a milky mass the oil is pure, but if it has a granulated appearance other oils have been added.

The simplest test for butter is to place a little in a spoon and hold it over a gas jet. If the butter boils evenly it is pure, but if it splutters and a scum appears margarine has been added.

To test flour, press a sample in the hand; if, when the hand is opened, the flour retains the impression of it and appears slightly yellow it is pure, but if it falls into powder and retains is usual colour adulterations have been added.

A good way to ascertain if milk has been "creamed" is to skim it after it has stood for an hour or so. If after the skimming a slightly bluish tinge appears round the edges, the milk is all right, but if the edges appear as before, the milk has been "creamed." To test if water has been added to the milk dip the point of a well-polished needle into it, and withdraw, holding the needle perpendicular, with the point downwards. If the milk adheres to the point it is pure, but if all of it drops off water has been added.

FARM HOMES.

MAKING THEM BEAUTIFUL

Beautiful home grounds are the first essential to a beautiful State. No matter how attractive the grounds around public buildings, or how well cared for the borders of our highways, or how numerous and fine the natural beauties of the State, if our home grounds are slovenly and unattractive, then we cannot boast of a beautiful State.

Our slogan should be, "All home grounds, attractive home grounds." Do I hear someone say, "Impossible or impractical." Not so! It is only impossible or impractical when there is no desire for attractive surroundings or lack of initiative or ingenuity in making them attractive. Too expensive! No, not necessarily, for a little labour and the seeds of a few annual flowers to be had for a few pence can often change a repulsive yard into a place which will attract attention and elicit favourable comment. Let us no longer look for lame excuses as a reason for not doing something which we know needs doing and which richly rewards him who brings about the transformation and gives pleasure to his neighbour and to the passers-by.

Fencing and Planting.

An attractive home ground must have the appearance of being well cared for. Nothing detracts more from a place than to have the yard littered with objects which do not belong there. This applies to the grounds in the rear of the house as well as to those in front. If it becomes necessary to store machinery or carry on certain operations between the house and barn, divide the space into two distinct areas and by proper fencing and planting hide the features which would detract from the beauty of home grounds. Twenty-five years ago one would scarcely see in a day's travel a farm home ground which was mowed with a lawn mower. But the farmer appreciates neat appearances as much as his city cousin, and as a result the lawn mower is rapidly becoming standard equipment on the farm. A hay field is attractive, but not when it surrounds the farm home. Mowing of the lawn is necessary, and the lawn mower is the best implement for that purpose. While other methods may be used for keeping the grass under control none of them produce as good a lawn or as satisfactory an appearance as the lawn mower.

Part of the Picture.

Make the house appear as a part of the picture you are painting with grass, shrubs, flowers, and buildings. To do this you must give the house a setting. Trees are valuable for this purpose. Tall trees at the rear of the house and at the sides at some little distance from the house are very desirable. They may not look like much soon after planting, but in years to come they will form a background and frame for the house which will enhance its attractiveness manifold. Trees may also be used along the highway, and if the lawn is fairly large, as individual specimens on the lawn, or if very large, possibly in small clumps. Stick largely to the native trees, particularly the more permanent kinds, and never plant them in rows except along the drive.—J. J. Moore, in "Hoard's Dairyman."

WOMEN AND THE PURSE.

Accustomed as we are to the phrases "economics" and "standard of living" nowadays, we are apt to disregard their real meaning. Miss Janet Mitchell (Thrift Service Director of the Government Savings Bank of New South Wales), at a New South Wales Agricultural Bureau Conference recently, pointed out that while we have concentrated on raising the monetary standard, we have devoted very little attention to the right type of education, which alone can make the individual really profit from increased wages and increased earning powers. Particularly have we been behindhand (said Miss Mitchell) in our appreciation of the importance of training woman for her vocation of home-making. The present economic condition of the country is to a certain extent the responsibility of each one of us, in so far as we have not been spending thriftily and intelligently. "I will take one factor which has contributed to a certain degree to our present economic ills," added Miss Mitchell, "the enormous growth of time-payment since the war, particularly of time-payment as applied to luxury purchases and to articles for immediate consumption, such as clothing. Now, who is responsible for the bulk of such time-payment purchases? The person responsible for the hold this particular type of trading has got on our community is the woman—the wife of the average wage-earner. Yet, can we

altogether blame her, with her lack of training in practical economics, for falling a victim to the lures of 'go-getter' salesmen? Can you expect a woman, who has never studied the question of time-payment in its relation to production and distribution costs, who knows nothing about the heavy overhead expenses of running a time-payment business, to realise that the purchase she makes, say, of £5 worth of clothing by cash order is just one drop more added to the cost of living, and that she, the wife of the man on the small or moderate income, is always the first to suffer by any increase in the cost of living? Or take, for instance, the case of a girl who has passed through high school (although her talents and her capabilities quite obviously do not fit her for a business or professional career) because her parents consider it sets a hallmark of social standing. Can you expect this girl, who has had practically no training in domestic arts, to make the first and most critical years of her married life run smoothly, with the comfort of a well-kept and well-organised home?

"The Domestic Science courses are doing excellent work for some of our girls; but just think what a small proportion of our girl population they are touching!—only a few thousands every year. In Europe and in the United States training in the financial side of home-management is a compulsory part of every girl's education, just as compulsory as the learning of reading and writing.

"At the present time, unfortunately, we have not trained ourselves to think sufficiently highly of the domestic arts—an attitude that is reflected by the whole status of domestic service, and, more seriously, in the unwillingness of numbers of parents to allow their girls to enter on a domestic science training. As one head mistress said to me recently, when she was deploring the relatively few entries there were for the domestic science section of super-primary schools: 'We cannot hope for better things while the parents look upon it as a slur on their child's mentality when you try to persuade them to let the girls take the domestic science course in preference to the commercial or the high school course!' Why should it be a slur on anyone's mentality to wish to learn efficiently the fundamentally important and extremely interesting household arts? Even for the girl who is pre-eminently fitted for a business or professional career, instruction in the intelligent ordering of her household is a necessity. The more skilled we are in any task, the more quickly will it be performed—the more time, therefore, will there be for those things which we consider most worth while.

"Here is a point on which I think we are being forced to revalue our standards. The fact that perhaps for many years we, none of us, will have so much money to spend on outside amusements will force us to lay more emphasis on the importance of simple recreation at home, will force us, therefore, alongside of this, to take more earnest stock of our homes, of our methods of home-making; it will force us to consider more seriously the enormous social value of the woman in the home who does well what is specifically a woman's work, with a sense of pride and dignity in its achievement.

"Country people especially (said Miss Mitchell in conclusion) had a tremendous opportunity to build up the very finest type of home-life, to make the home a centre of interest and recreation, not merely a place where meals were scraped together. The educational work of the Agricultural Bureau was helping people to think more seriously of the importance of building up the right kind of home environment. The only sane standards we could follow were those of living and spending in a manner without menace to our own or our children's future."

CONTROL OF WEEDS ON LAWNS.

Weeds in lawns and on bowling and golf greens cause considerable annoyance and trouble, and are often difficult to control, especially if proper precautions have not been taken from the outset. As a rule, most trouble is experienced on lawns and greens which have not been properly drained, or which are shaded, or where the soil has not been enriched before laying down the grasses. It is obvious, therefore, that control of weeds in such places must be kept in view from the time that the lawns are being established.

In the case of bowling greens and golf greens special care should be exercised to see that they receive direct sunlight throughout the whole of the day, particularly during the winter months, and also that they are thoroughly drained by means of agricultural drain pipes placed below the ground. The soil should also be enriched either by adding a better class of soil or by heavy dressings of well-rotted animal

manure. If these precautions are adopted and high-grade seed, free from weed seed, is sown thickly, little trouble will be experienced from weeds. Subsequently, a vigorous growth of the grass should be encouraged by frequent watering and by top-dressing with well-rotted animal manure composted with soil.

When such dressings are being made, care should be exercised to see that all weed seeds have been destroyed in the compost. This can only be done by compositing the soil and manure in heaps which can be kept under observation for some months. If it is not possible to ensure that the composts are free from weed seeds, it is preferable to use artificial fertilisers for top-dressing.

Despite the greatest care that is taken, however, weeds will occasionally appear in lawns, and they must be immediately hand-pulled. If care is exercised in this direction, no great difficulty will be experienced in keeping the weeds under control. Clover is often troublesome in lawns, and this can be checked to some extent by top-dressing with sulphate of ammonia, which does not encourage the growth of clover, but stimulates the growth of grass, which checks the clover.

Superphosphate and lime should not be used on lawns which are likely to be infested with clover, as they stimulate the growth of clover.

Chemical exterminators cannot be recommended to any extent for control of weeds on lawns, but they can be used, particularly arsenic preparations, for killing individual plants such as paspalum grass. A little of the preparation should be dropped on the middle of the plant.

BOUGAINVILLEA.

Visitors to the beautiful garden of Mr. Thomas, at Indooroopilly, this year were impressed with the many possibilities of design and effect that can be made with this very hardy and showy climber. The appreciation of the bougainvillea is shown by the hundreds of persons who go to see it in bloom. It is a hardy plant, and loves sunshine, and there is no reason why it should not be more widely grown. A little time and patience will amply repay anyone who contemplates its culture. Cuttings strike readily as soon as the blooming period is over. They should be about 12 inches long. Select last season's growth, and plant in sandy soil in a shady place.

Put the cuttings about 6 inches daay in the soil, and press down firmly. Keep the ground moist, not soaking wet. If you require a more immediate result, obtain plants from the florists in pots. There are about seven different colours to select from. When the plants have grown to a height of 2 feet then select your design and prune accordingly. To train the plant make a skeleton design of wire, and then trim the plant by removing all shoots that may be growing in a direction that is not required. About May or June pruning must be stopped, as all the new shoots then appearing will be flowering shoots. As soon as the blooming period is over commence pruning again to still improve your design.

There are many methods of growing bougainvillea, and one that finds favour with many is that of planting it around an old tree that is not wanted, and ringbarking the tree when the bougainvillea is firmly established. It will then hang down from the branches of the tree and form a beautiful garland of bloom. It is an evergreen and never appears unsightly.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Farm Notes for November.

Field.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make

their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

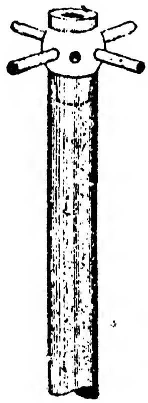
THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

A CLOTHES-LINE POST.

A serviceable clothes-line post was made out of an old boiler tube and a discarded waggon hub, as shown in the sketch. The boiler tube was cut to a length of 8½ feet, and sunk into the ground so that 6½ feet were exposed. Sections of gas pipe were placed at right angles through the hub, and the latter fitted snugly into



the top of the boiler tube. The construction was given several coats of paint, and withstood hard wear in the open. By using wooden plugs in the ends of the pipes, and boring suitable holes through them, the old boiler tubes may be used to build a substantial railing or fence.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October, 1930.		November, 1930.		MOONRISE. Oct. 1930.	MOONRISE. Nov. 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.36	5.48	5.5	6.7	p.m. 12.1	p.m. 1.31
2	5.35	5.48	5.4	6.7	12.58	2.25
3	5.34	5.49	5.4	6.8	1.52	3.17
4	5.33	5.50	5.3	6.8	2.45	4.11
5	5.32	5.50	5.2	6.9	3.39	5.16
6	5.31	5.51	5.2	6.10	4.33	6.16
7	5.29	5.51	5.1	6.10	5.25	7.8
8	5.28	5.52	5.1	6.11	6.21	8.11
9	5.27	5.52	5.0	6.12	7.18	9.13
10	5.26	5.53	4.59	6.13	8.16	10.15
11	5.25	5.53	4.59	6.14	9.17	11.13
12	5.24	5.54	4.58	6.15	10.19	...
13	5.23	5.54	4.58	6.16	11.19	a.m. 12.5
14	5.22	5.55	4.57	6.16	...	12.49
15	5.21	5.55	4.57	6.17	a.m. 12.20	1.25
16	5.20	5.56	4.56	6.18	1.15	2.0
17	5.19	5.56	4.56	6.19	2.7	2.32
18	5.18	5.57	4.56	6.20	2.49	3.6
19	5.17	5.58	4.55	6.21	3.26	3.40
20	5.16	5.58	4.55	6.22	4.0	4.18
21	5.15	5.59	4.55	6.23	4.35	5.0
22	5.14	5.59	4.54	6.23	5.9	5.48
23	5.13	6.0	4.54	6.24	5.46	6.43
24	5.12	6.1	4.53	6.25	6.25	7.40
25	5.12	6.1	4.53	6.25	7.10	8.35
26	5.11	6.2	4.53	6.26	8.2	9.31
27	5.10	6.3	4.53	6.27	8.56	10.27
28	5.9	6.3	4.52	6.27	9.52	11.22
29	5.8	6.4	4.52	6.28	10.46	12.15
30	5.7	6.5	4.52	6.29	11.44	1.7
31	5.6	6.6	...	...	12.40	...

Phases of the Moon, Occultations, &c.

8 Oct.	○ Full Moon	4 56 a.m.
15 „	☽ Last Quarter	3 12 p.m.
22 „	● New Moon	7 48 a.m.
29 „	☾ First Quarter	7 22 p.m.

Apogee, 3rd October, at 6.54 p.m.
Perigee, 19th October, at 5.42 p.m.
Apogee, 31st October, at 12.18 p.m.

Jupiter will rise at 1.23 a.m. on the 1st and at 12.34 a.m. on the 15th.

Saturn will rise at 10.47 a.m. and set at 12.29 p.m. on the 1st; on the 15th it will rise at 9.58 a.m. and set at 11.34 p.m.

The Moon will be in Sagittarius on the 1st, in Capricornus on the 2nd and 3rd, in Aquarius on the 4th and 5th, in Pisces on the 6th, in Cetus and Pisces on the 7th and 8th, in Aries on the 9th and 10th, in Taurus to the 12th, in Auriga and Taurus from the 12th to the 14th, in Auriga and Gemini to the 15th, in Cancer to the 17th, in Leo to the 19th, in Virgo to the 21st, in Libra to the 24th, in Scorpio to the 25th, in Orphineus to the 26th, in Sagittarius to the 28th, in Capricornus to the 31st, and in Aquarius on the 31st.

The two eclipses this month already mentioned will be the only ones visible in Australia this year. During the forty-one minutes when the Moon's partial eclipse will be observable in Western Queensland it will be interesting to notice how the toning down of the Moon's lustre will help to bring into view some of its best known features, such as the great mountains, Copernicus and Tycho, the Mare Crisium, Mare Tranquilitatis, and other great so-called seas. The Sun, being a few degrees south of the celestial equator, the shadow of the earth will be projected in a slightly northerly direction, hence the first contact of the Moon's limb with it will be only 18 degrees from the Moon's most northern point towards the west; then, instead of plunging deep into the shadow, the Moon will skim over rather than through it.

The Southern Cross will be in a horizontal position, 30 degrees west of the south celestial pole, at 6 p.m. on the 1st and at 4 p.m. on the 31st October.

4 Nov.	○ Full Moon	8 28 p.m.
13 „	☽ Last Quarter	10 27 p.m.
20 „	● New Moon	8 21 p.m.
28 „	☾ First Quarter	4 18 p.m.

Perigee, 15th November, at 4.30 p.m.
Apogee, 28th November, at 8.54 a.m.

Soon after midnight on the 7th the Moon will occult Eta Tauri, a star of about magnitude 2·9, which is very near the Pleiades. This will be interesting, especially to observers with telescopes.

Mercury will pass from west to east of the Sun on the 7th, it will be on the far side of its orbit, and, of course, invisible.

Jupiter will appear to reach the stationary point in its march eastward on the 8th; it will then appear to move backwards towards the west until 15th March next, when it will again appear to be near the middle of the constellation Gemini.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Event and Comment.

The Current Issue.

CONTINUING his history of the Queensland sugar industry, Mr. Easterby describes interestingly its development on the technical side. Another instalment of Mr. Currie's paper on the Brown Cutworm is added. Mr. Quodling's account of pasture experiments on newly reclaimed pear land at Palardo will be welcomed by all interested in the extension of land settlement. Seed maize improvement work is reviewed by Mr. McKeon. Major Cory has some seasonal notes on mammitis and lung worms in calves; while diseases of the pig are further discussed by Mr. Shelton. Mr. Carew continues his observations on farmers' sheep and wool, including the management of small flocks. The prospects of extending Australian trade with Eastern Asia are reviewed by Colonel D. E. Evans, who, after attending the recent World's Engineering Congress in Tokyo, toured extensively in Japan, Korea, Manchuria, and China. Well supplied regular features make up a very readable issue.

Native Flora.

HEARTY approval was given by Parliament to a Bill for the preservation of our native flora, which was introduced recently by the Minister for Agriculture and Stock (Mr. H. F. Walker). Mr. Walker said that the measure was one that had been needed for a long time past. On the numerous islands along the coast of Queensland there was a great wealth of vegetation, including staghorns, elkhorns, orchids, and ferns; but many of the islands had been denuded of their floral wealth for private gain. The more general use of motor cars and motor boats had aggravated the evil. It was proposed under the bill to protect our beautiful and, in many respects, unique vegetation, not only in the islands and the coastal districts, but also that of other parts further inland.

Agriculture in Queensland.

IN his annual review of departmental activities presented to the Minister for Agriculture and Stock (Mr. H. F. Walker), the Under Secretary (Mr. E. Graham) says that the past year was remarkable for a steady agricultural advance in Queensland. A general movement towards higher production standards was also apparent in the period under review.

In a State like Queensland, with its enormous territory and wide range of soils and climate—temperate, sub-tropical, and tropical—there can be little uniformtiy in rural conditions. The agricultural situation for the year was, however, much more even from the standpoint of production than the preceding one, and reviewing the whole period the brighter aspects predominated. Substantially larger returns were obtained from all sources of rural wealth, and present prospects are a sound basis for healthy optimism. There are indications, too, that the current agricultural year will provide further evidences of complete recovery from a series of adverse seasons. This is demonstrated by increased production, and numerous signs of progress in the improvement of manufacturing processes and marketing arrangements.

New gains have been recorded in field efficiency as well as by results of well-directed efforts towards more systematic marketing of primary products. There is a general realisation, however, that the farming problem is not solely one of production; it is also distinctly one of marketing. Price depression in some commodities was a natural consequence of a glutted domestic market. The year's experience shows that the demand side of the equation calls for further careful study and satisfactory adjustment. The strengthening of marketing machinery by which products are fed adequately into the ordinary trade channels is required, to avoid over-supply or shortage and keep prices at a reasonable level. The need of economic information on which wise adjustment may be based is becoming each year more insistent.

It is pleasing to report that farmers themselves are displaying a tendency to study closely influencing commercial factors, and also to look for and apply economic intelligence in planning their seasonal programme. This is being done much more than formerly, and from a development of this tendency has arisen a call for more relevant information on crop demand and methods of disposal.

There was a considerable expansion of acreage during the year, and crops generally moved to market in increasing volume.

In departmental activities, considerable progress was made, and a wide scope of instructive, constructive, and administrative effort was successfully covered.

Crop Yields for the Year.

THE wheat yield for the year was the highest yet attained in Queensland, and surpassed all expectations. The harvest returns were 4,235,172 bushels, as against 2,515,561 bushels for the previous year. The grain was of good milling quality. This fine result was due, apart from timely rains, to careful and thorough cultivation, which is becoming characteristic of wheat-farming in Queensland. Good progress was made in wheat-breeding at the Roma State Farm. Varieties bred there were sown largely. They have proved, in the main, good yielders, and are becoming more favoured each season. The value of the wheat breeding and extension work of the Department is becoming increasingly evident. Varieties and types evolved have survived searching tests under practical field conditions. Breeding plots were established at several suitable centres, and the varietal trials entered on thereat represent a continuity of the work carried on from season to season. The system, in brief, is the testing of new Roma crossbred wheats under actual working conditions, the elimination of undesirable varieties, and the propagation of the selected strains. Included in the trials are 240 new Roma crossbreds and forty standard varieties.

A seed wheat improvement scheme approved by the Department and the State Wheat Board was made effective. Satisfactory results were obtained, both as regards yield and general field behaviour of the wheats involved. Growers have co-operated heartily in this work, and purpose extending their acreages as a result of the successful operation of this scheme.

In the Central Division grain-growing is extending gradually, particularly in the Dawson Valley. The possibilities of a more rapid extension in Central Queensland are being explored by the Department, and to that end varietal trials are being carried out in different localities. Last season Dululu on the Dawson, and Retro in the Capella district, were the main centres of these activities. Though the rainfall was very light, satisfactory yields were bagged.

The usual annual crop competitions were held in the Warwick and Toowoomba districts; and as a stimulus to farming efficiency, their importance is becoming

more widely recognised. Their educational value is also appreciated by all engaged in grain production.

Although the presence of "flag smut" was reported from many localities in the 1928 season, it is noteworthy that in the next succeeding crop very few individual stands were affected, and where there was an appearance of disease it was present in only a minor degree. This favourable condition may be attributed to the acceptance of precautionary measures advocated by the Department for checking the disease, and to the nature of the season.

The consensus of opinion is that marketing arrangements have improved under the recent agreement between the Wheat Board and the millers. This agreement has also had a stabilising effect on prices.

A considerable increase in acreage under crop is expected this year. The present crop prospects are good, though early planted wheat is too far advanced for this time of the year, as a result of over-generous winter rains.

Weather conditions during the planting season were not generally favourable for maize, and early crops were consequently light. The late-sown crops had the advantage of the December rains and prospered accordingly. Market values were high, especially when only limited supplies were available at the beginning of the season. Heavy summer rains marred the crop prospects on the Atherton Tableland. "Rust" occurrence was one of the results. A dry February, however, helped to create a favourable balance of seasonal circumstances.

Satisfactory progress is being made in seed maize improvement, and the demand for seed of improved varieties evolved by departmental officers is constant, and available supplies are eagerly sought. The value of this work was made manifest at the Royal National and other shows where exhibited grain illustrated the success of the departmental breeders. The principal varieties of maize now grown in Queensland are of departmental origin. This is the outcome of systematic breeding and regular distribution of pure seed.

Upwards of 100,000 bushels of malting barley were produced last season on the Darling Downs. Individual yields were high and the quality was uniformly good. The whole crop went into local consumption. The current season's sowing has had the advantage of an excellent start and high yields are anticipated, also improved marketing arrangements under the Barley Pool Board which was constituted in the course of the year. The development of improved varieties is in hand. Field officers are testing some very promising barleys, including several new crossbreds, the product of the Roma State Farm. Special attention is being given to these comparative tests in order to assist in the revival of barley-growing on the Downs. For the same purpose seed of the Californian brewing type has been imported from England for trial and propagation.

The testing of suitable varieties of oats for the purpose of determining their qualities for grain, hay, and green fodder, respectively, was continued during the year with satisfactory results.

Production of canary seed increased very substantially, 280 tons being harvested, as against 50 tons, approximately, in the previous year. As this crop is grown in no other State and annual Commonwealth requirements are about 1,500 tons, it certainly warrants more attention from Downs farmers. The acreage planted this year promises, on present prospects, to produce sufficient seed for Australian needs. Its grazing value, too, is considerable, though it is susceptible to dry-season checks. In furtherance of our efforts to bring this crop into more general and regular cultivation, special plots were established successfully for the purpose of raising enough seed of an improved strain to extend its cultivation.

The cultivation of root, fodder, and other field crops is covered by Mr. Graham's report; also fertiliser trials, mainly with winter fodders. Increased attention has been given to onion-growing in the Central Division on a scale large enough to supply local and Northern requirements. For the guidance of farmers, variety trial plots were established in several centres, and satisfactory results were achieved.

In the course of the year consideration was given to the possibility of opening up new furrows in agricultural production in Queensland, and the extension of tobacco cultivation has been advanced substantially. Progress was made in experimental work, particularly in the northern division of the State.

In Queensland, we have a promising field for the production of bright, flue-cured leaf of good texture and smoking quality. Results of our new experiments, so far, go to show that we may in the not far distant future be able to supply an appreciable proportion of the tobacco leaf required for Australian use. The economic importance of this prospective development may be measured by the fact that tobacco to the value of more than £2,000,000 is imported into the Commonwealth annually.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XI.

(c) Mills and Milling Work.

THE history of the rise of sugar-milling in Queensland is an intensely interesting study. Comparatively speaking, it is not so many years ago that sugar manufacture was commenced in this State on a crude and insignificant scale, and when one looks back from the fine up-to-date sugar-mill at Tully, for instance, costing some £750,000 and capable of crushing over 200,000 tons of cane in a season, to the humble crushing plants of the very early days worked by horse or cattle power, it is apparent how far we have progressed in the last fifty or sixty years. But to the pioneers of the sugar industry in Queensland, those who worked hard early and late in clearing land, planting, and making sugar, a due meed of credit must be given. They took all the risks of an unknown industry, and we have but followed in their footsteps with better knowledge and improved facilities.

As a matter of interest to the present-day manufacturers of sugar, a description of one of the old early primitive sugar-mills at St. Helena, driven by horse power, is given below, taken from a book on the sugar industry published in 1870, and written by Mr. Angus Mackay:—

> "The mill now at work at St. Helena is a low-priced but good machine for parties cultivating from 10 to 30 acres of cane. It is a vertical horse-power mill, obtained from Messrs. Smellie and Co.'s foundry, Brisbane, at a cost of £120. This mill consists of three vertical rollers, each 18 inches in diameter, 15 inches high, and well secured with iron bolts through cast-iron plates at the top and bottom. To secure an elevation sufficient for the fall of the juice into the clarifiers and from the evaporating pans, the mill is erected upon rising ground, by which means a fall of about 5 feet was obtained, and this was found sufficient for all purposes. A passage 10 feet wide and 6 feet high should be made under the horse walk, which allows of a dray being backed clean up to the rollers. Megass and other refuse can be taken away by the same means. The mill is placed about 20 feet from the end of the boiling house to give the horses a sufficiently roomy walk. The horse shafts or poles, 18 feet long, are four in number, so that two or more horses can be employed at one time. For a mill of this power six horses are necessary to work (say) ten hours a day; and if kept steadily at work during that time sufficient cane could be crushed to produce liquor for about half a ton of sugar. The boiling house at St. Helena is 40 feet long by 25 feet wide, with 12-feet wall plates; it is built of hardwood and pine and covered with shingles. There are six windows on each side, part Venetian work and part glass, with an open space of about 18 inches on either side, near the eaves, the full length of the building; there is also a turret, 3 feet square, on the top of the building filled with louvre boards, which completes the ventilation. In this building are fitted the clarifiers, evaporating pans, and tache. The two clarifiers, each capable of containing 200 gallons, are at the end nearest the mill and connected therewith by a galvanised-iron pipe, through which the juice is conveyed. They are set in brickwork with separate furnaces and flues, the latter leading into the

main flue. They are so placed that the bottoms of the clarifiers are 4 inches above the top of the evaporating pans, and at a right angle with them. The furnace, tache, and evaporating pans run along about 4 feet from one side of the building; the whole of the pans are set in brickwork, with a main flue passing underneath them and between the clarifiers. The furnace for this battery of pans is of Brisbane firebrick; it is 7 feet 6 inches long, 2 feet wide, and 2 feet high, arched over with a curve 5 feet 6 inches by 2 feet; the tache hangs at the end of the furnace, the bottom about 2 feet above the bars, whilst the brickwork is arranged for the fire to play all around it. The end of the evaporating pans is 14 inches from the lip of the tache. The evaporating pans, of iron, are joined together, and present a surface 18 feet long, 3 feet wide, and 18 inches deep, which is divided into three compartments. The flue passes under the whole length of them, between the tache and the clarifiers, having a damper at the far end. This flue is 2 feet wide and 18 inches high, and the whole range is built so that the furnace, tache, and evaporating pans fill up the space between the end of the building and the clarifiers. The length of the flue is 45 feet from the front of the furnace to the base of the chimney. The chimney, 4 feet 6 inches square at the base, is of brick on a stone foundation and is 29 feet high, with a 6-inch batter on each side. The furnace door is outside of the building. Brickwork is carried 12 inches above the lip of the tache and is then covered with sheet lead down to the lip, the form being dished out on the side nearest the evaporating pans, so that the syrup, when boiling over, may flow into them. Both the evaporating pans and the tache may be at the same elevation. The edges of the evaporating pans are bound round with hardwood battens to keep the iron from bending. The coolers are 5 feet by 4 feet at the top and 12 inches deep, bevelled on either side about 3 inches; they are of 1¼-inch cedar, and answer well, although the wood for the first day or two slightly discolours the sugar; this, however, may be avoided by filling them with boiling water two or three times. The drainers are made of the same material and are 5 feet long by 3 feet wide and 18 inches deep, bevelled 6 inches, with a false bottom of perforated zinc and a hole at the end for molasses to escape. We are now trying another plan, which, I fancy, will drain the sugar better still—that of putting canvas bags for drainers over false bottoms made of narrow battens. There are, however, so many different drainers in use that experience is necessary to determine the kind most suited for particular sugars. For the St. Helena mill canes about 4 feet in length fit best; when of greater length they are inconvenient when passing through. Two, or sometimes three, pieces are sufficient between the rollers at a time; but these must, each as it disappears, be replaced regularly to ensure uniformity of crushing without more than ordinary wear and tear to the machinery. As the juice reaches the mill bed it runs into galvanised-iron piping, attached to which are two strainers of fine wire gauze, and thence into the clarifiers. After the bottom of one of the clarifiers has become covered with juice a slow fire is lit underneath, and increased as the clarifier fills, the heat being regulated accordingly. When a clarifier is full quicklime, previously prepared by mixing it with water until it has attained the consistency of cream, is added, according to the acidity of the juice, and tested by litmus paper, and if the paper

retains its original tint sufficient lime has been added to the juice. No stated quantity of lime can be used with certainty in any particular variety of cane as its acidity varies considerably; each pan is therefore tested in this manner. We have used lime made from both coral and shells, but find neither answers so well as stone lime from Rockhampton. Lately I have used bisulphite of lime, placed in a small receiver, over, and allowed to drop into the clarifier at the rate of about three drops per minute, or about two drops to the gallon. This is found to be a great improvement, and about one-third less lime is necessary in the liquor afterwards. The addition of bisulphite makes the sugar cleaner, and, in the event of the juice having to remain in the clarifier for some time, it is prevented from fermenting. It is, therefore, a decided improvement upon lime temper. When the clarifier is full and tempered as above it is brought up to a heat of 140 deg. Fahr. and stirred well round so as to diffuse the limewater evenly through the whole body; it is allowed to settle and then brought up to a heat of from 190 to 200 deg. and skimmed. The liquor is then allowed to run through flannel bags into the evaporating pans, most of the sediment being retained in the clarifier. Whilst the first clarifier is emptying into the evaporating pans the second clarifier is filling to undergo a similar process. A fire has before this been lit under the tache, which was previously filled with water to prevent it from injury. The heat from this fire having reached the evaporating pans, the liquor is allowed to boil and evaporate in the three compartments up to a heat of 220 deg., by which time it has reached a density of 28 deg. by Beaumé's saccharometer; the water is then removed from the tache and the syrup ladled in from the nearest evaporating pan, and it is then brought to a heat of 228 or 230 deg., but not higher, as the lower the syrup is boiled up to granulation point the better the quality of the sugar, whilst a more intense heat will probably burn the syrup and discolour it. When it has reached a temperature of (say) 228 deg., the fire is withdrawn, the damper put down, and the syrup run through a long narrow pine trough to the coolers on the other side of the building, where it is well stirred and allowed to remain for twenty-four hours. In that time it granulates. From the coolers the sugar is transferred to the drainers, where it is allowed to remain as long as possible, the time required for the drainage of the molasses from the sugar varying with the nature of the drainers and the state of the atmosphere.

"In consequence of the great difficulty of drying sugar from the variableness of the atmosphere, a centrifugal machine is being constructed wihch is intended to work either with a small steam engine or hand labour. Seventy per cent. was mentioned as being good extraction."

As time went on the inadequate horse and cattle mills were abandoned by degrees. These were mostly of a vertical nature.

Horizontal mills consisting of three heavy cast-iron rollers accurately turned and generally slightly grooved on the face and fixed between two cast-iron frames securely bolted to a cast-iron bed plate, which also formed the receptacle for the expressed juice, began to come into use. In a mill of this description two rollers were below and placed parallel to each other and one above. These rollers were from 12 inches to 3 feet in diameter, and the speed found most advantageous for expressing the

juice from the canes was at the rate of 20 feet per minute. The canes were fed from a table, and after being squeezed between the first and top under roller were guided between the top and second under roller by a plate which is still called the "dumb turner." Steam engines were used for driving these horizontal mills, the class of engine most commonly used being the horizontal high-pressure engine—simple in construction, strong and substantial, the working parts being highly finished, other parts being black and painted. It was stated that many preferred to have a highly polished engine, but that such an engine would cost about 30 per cent. more than a black engine, but the bright work cost a good deal more to keep clean.

Steam also began to be used for boiling the juice, and centrifugal machines came into use before 1870 for separating the grain from the molasses, while vacuum pans were being talked about, and at some little time afterwards began to be installed.

It is perhaps as well, as the knowledge of facts concerning the early history of sugar-mills becomes in the course of time more and more difficult to obtain, that I should place on record the names of the earlier plantations or their owners as far as I have been able to obtain same.

NAMES OF OLD PLANTATIONS AND OWNERS (WHERE POSSIBLE) PRIOR TO 1875.

District.	Locality.	Name of Plantation.	Names of Owners.
Southern ..	Nerang ..	Bundall	Holland Miskin & Co.
Do. ..	do.	Birribi	Philpott Bros.
Do. ..	do.	Benowa	R. Muir
Do. ..	Logan and Albert	Loganholme ..	Fryar and Strachan
Do ..	do.	Sederhoff	Palm
Do. ..	do.	Noyea	Gartside, Muir and Black
Do ..	do.	Pinwells	..
Do. ..	do.	Beenleigh	Davy and Gooding
Do. ..	do.	Yatala	Witty
Do. ..	do.	Helensvale	White and Robinson
Do. ..	do.	Miles and Ardates ..	..
Do. ..	Oxley Creek ..	Francis	..
Do. ..	do.	Jamieson's	..
Do. ..	do.	Berry's	..
Do. ..	do.	Grimes and Co.'s ..	..
Do. ..	do.	Dr. Waugh's ..	..
Do. ..	do.	Ormiston	Hon. Louis Hope
Do. ..	do.	M'Leod's	..
Do. ..	St. Helena ..	St. Helena	Government
Between Brisbane and Mary-borough ..	..	Eton Vale	Canny and Moreton
	..	Alford	Farquhar and Dunn
	..	Waitemata	T. Wood
Do. ..	..	Irrewarra	R. Tooth
Do. ..	..	Yarra Yarra ..	R. Tooth
Do. ..	..	Yengarie Refinery ..	Tooth and Cran
Do. ..	..	Iindah	Ramsay Bros.
Do. ..	..	Iveragh	M. Canny
Do. ..	..	Mona	R. F. Clarke
Do. ...	..	Iwood	C. D'Oyley Aplin
Do. ..	..	Dunrobrum	J. M. Illidge
Do. ..	..	Ferney	P. O'Kelly
Do. ..	..	Frankston	Capt. Jeffrey, R.N.
Do. ..	..	Antigua	Hor Brown
Do. ..	Tinana Creek ..	Magnolia	..
Do. ..	Maryborough ..	Maryborough ..	Maryborough Sugar Co.

NAMES OF OLD PLANTATIONS AND OWNERS (WHERE POSSIBLE) PRIOR TO 1875—*continued.*

District.	Locality.	Name of Plantation.	Names of Owners.
Mackay ..	Mackay ..	Balmoral	W. Hyne
Do. ..	do.	Medowlands.. ..	Fitzgerald
Do. ..	do.	Davidson's	..
Do. ..	do.	Hewitt's	..
Do. ..	do.	Branscombe.. ..	Martin and Long
Do. ..	do.	Nebia	Ganes and Fitzsimmons
Do. ..	do.	Dumbleton	Lloyd and Williams
Do. ..	do.	Pioneer	Spiller
Do. ..	do.	Foulden	Amherst and Co.
Do. ..	do.	River Estate ..	Long and Co.

In 1880 the sugar-growing and sugar-milling areas were split up as follows:—

1. The Southern district, extending from Nerang Creek near the border of New South Wales to Maroochy Creek (Nambour);
2. The Central or Wide Bay district, from about Maroochy to Bundaberg;
3. The Mackay district;
4. The Cardwell district.

Taking the Southern district first, there were mills at Nerang Creek, several mills about Coomera and Beenleigh, mills at Mount Cotton, Redland Bay, Cleveland, Hemmant, St. Helena, Indooroopilly, Oxley, Sherwood, Bald Hills, Burpengary, Caboolture, Mooloolah, and Maroochy.

The Central sugar-growing district ran north from Maroochy, but there was no sugar-mill before Tiaro, then came mills at Antigua, Tinana Creek, the Mary River, and Maryborough. At Bundaberg there were then three mills.

The Mackay district was a compact locality in 1880 with sixteen sugar-mills working close to one another, chiefly on the Pioneer River.

In the Cardwell district there were two mills on the banks of the Herbert River, and at Cairns there were another two.

At the time Mr. Roth wrote his "Report on the Sugar Industry in Queensland" (viz., in 1880), he said that 114 mills had been started in Queensland.

At that period the manufacture of rum was a side line in Queensland, and in 1875 there were fourteen stills at work; this number was reduced to nine in 1878.

The Gibson family, now so well known in connection with the fine up-to-date plantation and sugar-mill at Bingera, near Bundaberg, commenced the manufacture of sugar first at Doughboy Creek (Hemmant) on the Brisbane River. The plate accompanying this section is of the old mill, and in it may be seen the late Hon. Angus Gibson and his father. At that time and when the Gibsons opened up Bingera there were four sons, all subsequently well known and prominent in the industry—viz., Angus, William, James, and John. Of these, the only survivor is Mr. John Gibson, but the family traditions are worthily carried on by Mr. W. G. Gibson, Dr. A. J. Gibson, and Mr. A. L. Gibson, who manage the Bingera Sugar Company and plantations.

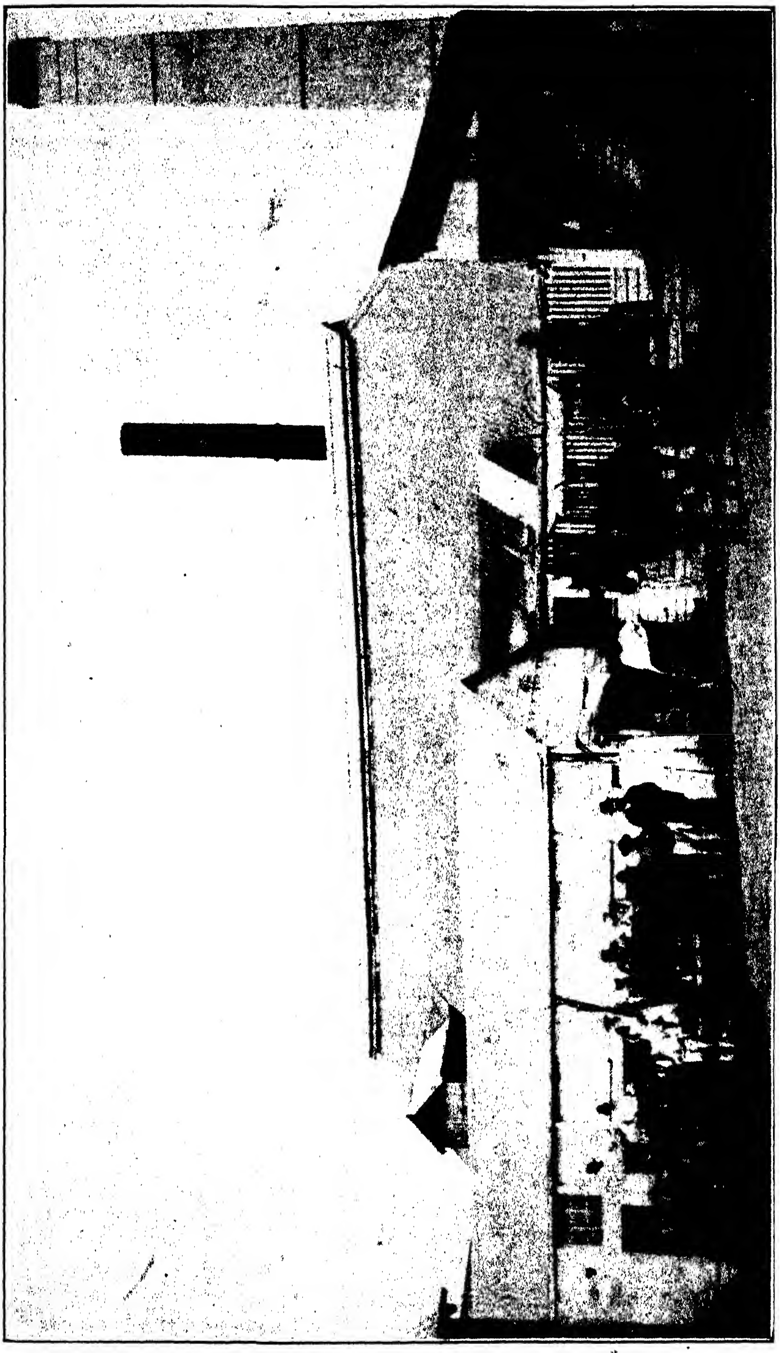


PLATE 134.—GIBSON BROS. FIRST SUGAR MILL, HEMMANT, DOUGHBOY CREEK, NEAR BRISBANE.

Included in the group are the late Hon. Angus Gibson and other members of a family that has contributed much to the success of the sugar industry in Queensland.

At the time of which we are now writing—1878 to 1880—Mr. Roth says:—

> "At Yengarie Refinery, Maryborough district, the juice is brought from the neighbouring mills partly in punts and partly in pipes, as the greater number of the mills crush the cane only (the juice is limed at the rate of 15 lb. to every 100 gallons of juice). The refinery gives the planters for 1 gallon of juice at a density of 10 deg. Beaume, 1 lb. of sugar; for every degree more or less 10 per cent. is added or deducted."

This was considered to be equal to £21 per ton of sugar in 1879—i.e., for every 2,240 gallons of juice at 10 deg. Beaume delivered at Yengarie the planter received £21. Some of the planters were of the opinion that it paid them better to sell their juice thus; others found they could make the sugar more profitably themselves.

Even as far back as those days there were differences of opinion between those millers who bought cane and the farmers who sold cane, the small settlers complaining that they were badly treated by the mill-owners; but, on the other hand, it was stated that these small settlers belonged to the most prosperous agriculturists of the colony.

It is rather amusing to read in literature published about this time that one of the claims for a sugar-mill called the "Victor"—a small horse-power mill—was that it could be easily shifted and reset, and it was asked by a critic to fancy an Australian humping a sugar-mill about with him like the itinerant sugar manufacturers of India and China.

By 1880 there were fifteen vacuum pans in Queensland, three in the South, four in the Central, seven in the Mackay, and one in the Herbert River districts. At that time the general demand was for a rather medium-sized white-grained sugar and yellow grocery sugars. About two-thirds of the sugar made went into direct consumption and not through the refineries. It was stated that Queensland sugars lacked the brightness and "bloom" of a good Demerara sugar, which was attributed to defective clarification.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Cane Beetles are Likely to Appear this Month.

The fall of about 9 inches of rain experienced last month (October) has helped to provide more moisture in the upper subsoil than is usually met with during the beginning of November. In the event, therefore, of additional showers being obtained about the middle of this month, greyback beetles are likely to make an earlier emergence from the soil than usual. Since the year 1914, eight annual emergences have occurred in December, five in November, two in October, and one in January.

Make Arrangements for Collecting Cockchafers.

On cane areas known from past experience to be subject to grub attack, growers should start collecting "greybacks" from the foliage of their feeding-trees directly these beetles appear on the wing.

No time should now be lost in locating the position of favourite food plants, such as native figs (*Ficus pilosa, F. glomerata, F. nesophila*, &c., *Eucalyptus tessalaris* ("Moreton Bay Ash"), or others on which these insects have been observed to congregate, chancing to grow close to headlands of their canefields. To facilitate

collecting, clear away all litter or vegetation from the surface of the ground under such trap-trees. Continue the work each day for about five weeks, dating from the beginning of the flighting period.

Make a note of the date of this emergence, as it may prove very useful later on in the event of a farmer wishing to fumigate his soil for cane grubs, as such information would enable him to determine the age of the grubs present, together with the correct time for commencing control work.

Do Not be Without a Spray Pump.

However small the cane farm, no grower can afford to be without the means of fighting such insect pests as "army worms," leaf-eating beetles, or caterpillars, &c. Such invasions are best combated at the right time—viz., when first noticed—as delay of a week or so while sending away for apparatus and chemicals often means material financial loss which might have been avoided. In addition to controlling the ravages of various cane pests, a spray pump often proves useful for treating insects attacking fruit and vegetables, or spraying animals for ticks, &c.

A good bucket pump, which costs under £3, can be recommended as very suitable for applying disinfectants, insecticides, water-paints, limewash, &c., and is designed with a view to being easily fitted to the inside of a small barrel, Kerosene tin, or similar container for holding the solution to be applied. For field work, a knapsack pump will be found very useful when spraying cane leaves attacked by "army worms" or other leaf-eating caterpillars. One having a liquid capacity of about 3½ gallons can be carried conveniently, and only costs about 45s.

When buying a spray pump, see that it is made of brass or copper, and fitted with an effective agitator and large compression cylinder ensuring even distribution.

Remember that all such machines last very much longer if cleaned thoroughly after use, particularly if corrosive liquids have been sprayed.

ENTOMOLOGICAL EXHIBIT AT INNISFAIL SHOW.

An interesting exhibit by the Bureau of Sugar Experiment Stations was taken from Meringa Entomological Station to the Innisfail Show in September. The exhibit comprised showcases depicting the life-histories of all the principal cane pests, charts showing enlargements of the more important ones and their parasites, and spirit specimens of the chief grubs attacking cane. Samples of poisons used in combating grubs were also shown, and a general collection of North Queensland insects, principally of those insects more nearly related to the various pests.

Assisted by a pathological exhibit and one of seedlings from South Johnstone Experiment Station a very comprehensive display was staged, and the farmers attending the show evinced great interest in it, numerous questions concerning the exhibit and cane in general being asked by visitors.

The show committee at Innisfail are to be congratulated on its success, and thanks are due to its members for their assistance in arranging and protecting the Meringa exhibit.

SUGAR LEVIES.

Following is the result of the referendum in connection with the undermentioned sugar levies:—

Defence Fund Levy.

On the making of a levy by the Queensland Cane Growers' Council at the rate of 1d. per ton of sugar-cane harvested during the current season for the purposes of a defence fund—

	Votes.
For	1,997
Against	1,126

Marian Central Sugar-mill Levy.

The making of a levy of 1d. per ton on all suppliers of cane to the Marian Central Sugar Mill during the present season, to be expended only in the interests of defraying the costs of employing a farmers' representative at the Marian Central Sugar Mill—

	Votes.
For	99
Against	75

A bare majority only was necessary on these questions. The proposals were therefore carried.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART IV.

CONTROL MEASURES.

THESE may be dealt with under the four headings—

(1) Cultural,

(2) Traps,

(3) Poisons,

(4) Biological.

Cultural.

Considering the four stages in the life history of the insect—egg, larval, pupal, and adult stages—it is considered that the eggs are not likely to be open to control by cultural means; the moths are immune, the caterpillars are subject to a certain degree, and the pupæ are particularly open to control by this method.

Keeping weeds down in fallow lands prevents the breeding-up of larvæ in these areas, while ploughing-in of weeds will eventually prove fatal to most of the larvæ which have been feeding on them. It is not true that all larvæ will perish if their food is ploughed in, for some will finish their growth on the plants in the soil, while others in the sixth instar will succeed in pupating even if not full fed. The fifth instar is, however, incapable of pupation.

Some laboratory experiments were tried to test the length of time the larvæ could exist without food but limitation of material inhibited extensive experiments in this connection. The results are shown in Table VIII.

TABLE VIII.

LARVAL RESISTANCE TO STARVATION.

Average Temperature.	Instar of Larva.	Days Starved.	Remarks.
62 deg. Fahr.	V.	22	Died
65 deg. Fahr.	VI.	17	Pupated successfully
70 deg. Fahr.	V.	11	Died
72 deg. Fahr.	V.	12	Died
70 deg. Fahr.	VI.	15	Died
75 deg. Fahr.	VI.	5 + 8*	Pupated successfully

* Starved for 5 days then fed and starved for 8 days more.

Fallow ground with a loose surface covered with weeds is an ideal breeding place for *Euxoa radians,* so fallows should be kept as clean as possible. Sometimes cutworms will breed up in a crop which has been allowed to become weedy, without attacking the crop itself, but living on the weeds. Such weedy crops are a menace as breeding places for the cutworms, which may attack cultivated crops in their next generation.

The fact that cutworms can live for many days without food shows that a weedy fallow in which cutworms are known to be present should not be planted up with a vulnerable crop without an interval of about three weeks elapsing between preparation of the ground and planting.

In extreme cases *Euxoa radians* has been known to act as an army worm over a short distance, that is to say, it has bred up and fed in a certain area until the larvæ have become too numerous for the food supply. They then marched from the area towards some new feeding ground. The destruction of the feeding ground (if weeds) when the larvæ are seen to be numerous may be possible under certain circumstances, or a trap furrow ploughed to arrest the advance.

The form of furrow suitable for checking the advance of *Euxoa radians* should have the following properties:—

(1) Side next to area to be protected should be steep or overhanging.

(2) This side should be crumbly and not moist and caked. A ridge of crumbly earth on top of the steep slope usually thrown up by a swing plough in friable soil will be very effective in checking exit from the furrow.

(3) No roots or pieces of debris should form a bridge from the bottom of the furrow to the top.

(4) If the furrow is perfect and in a friable soil, a depth of 6 inches is sufficient, but 8 inches or 10 inches forms a better protection under ordinary conditions.

To ensure success, trap furrows should be baited with poison bait when the cutworms are seen in them.

The pupa, spending the winter in the soil as it does, is open to destruction by ploughing. Such ploughing should always be done before the end of August if possible so that few will have emerged as moths.

Cultivation between the rows in a field attacked will also destroy some pupæ at any time of the year.

Traps.

There are various forms of light traps and fermenting bait traps used for capturing moths.

The "Andres-maire" trap appears to give considerable success against the moths of *Agrotis ypsilon* Rott. in the Tal lands of Mokamah, India.[13] This success is obtained in an area on which the moths congregate in great numbers at a particular time, and so are particularly open to such means of control.

Fermenting molasses for bait traps has been used with some success in Russia and other countries, against cutworm moths. In Russia open pans of molasses were used with success, but the same method used in America gave negative results. The method, at present somewhat uncertain, may yet prove of considerable value in cutworm moth control. In Queensland[14] traps containing fermenting apple juice and vinegar set out to catch codling moths caught considerable numbers of cutworm moths.

In Queensland the agricultural areas are scattered and much broken up by virgin bush, and so appear altogether unsuited to the use of traps in most places. Although traps may be found to be of local use they were not thought sufficiently promising to experiment with on an extensive scale, as poison baiting for the caterpillars recommends itself to the farmers and is a fairly sure remedy.

Poisons.

Poison baiting for cutworm larvæ has been practised for many years. As poisons, various arsenicals and fluorides have been successfully used. As media for carrying the poison, wheat bran, shorts, horse dung, chopped greens, carrots, and prickly-pear have been used with success.

A prickly-pear bait of some interest has been developed in South Africa.[15] The preparation of this is given as follows:—"To 2 gallons of soft water add 6½ oz. of commercial sodium fluoride (95 per cent. pure), and stir. Chop up an equal volume (2 gallons) of prickly-pear into pieces the size of a thumb. The pieces should be cut clean and not crushed. Add the prickly-pear to the solution and stir. Soak overnight, preferably stirring once or twice during soaking. Drain through a coarse sack or wire mesh, and save the residue, which will keep indefinitely, for house-fly bait."

An advantage of fluoride over arsenical poisons is that fluorides are much less poisonous to stock and human beings. This bait has not been experimented with in Queensland, but the formula is given in case any farmer should wish to try it.

In Queensland wheat bran is readily available everywhere and arsenical poison is usually easy to procure, so experiments with *Euxoa radians* have been confined to testing the best strength of Paris green-bran baits, calcium arsenate-bran baits, and calcium arsenate spraying to control the larvæ.

Poisoning Experiments.

In the first experiment the relative efficacies of Paris green bran baits, and spraying the seedlings of cotton with calcium arsenate were tested.

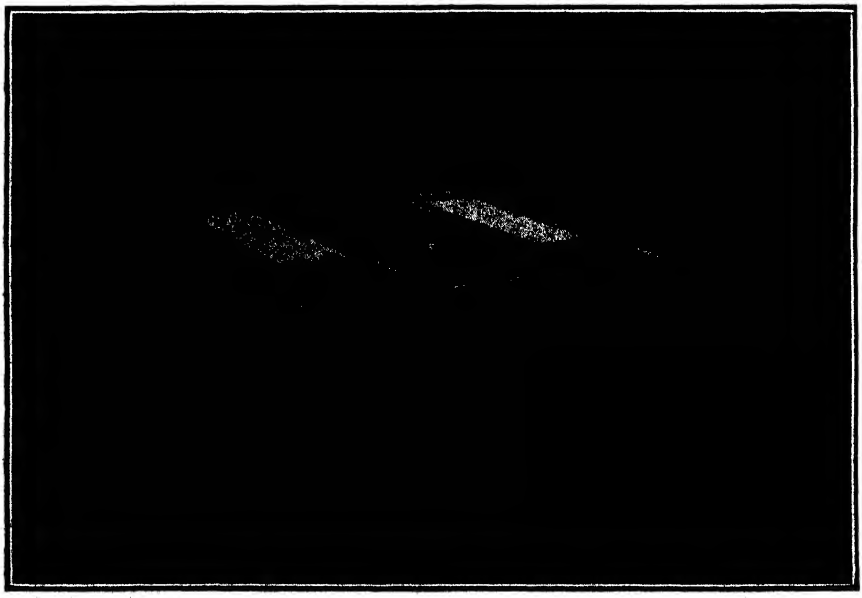


PLATE IX.

Type of cage used at Cotton Research Station, Biloëla, in experiments to control cutworms by poison baits.

Rows of cotton seedlings about a week old were selected and three cages of the type shown in Plate IX.* were placed over them.

Cage No. 1.—Eighty-three cutworm larvæ put in (fourth, fifth, and sixth instars). Paris green bran bait, 1 lb. Paris green, 24 lb. bran. Moistened with water and sweetened with molasses.

This was freely sprinkled amongst the seedlings.

Cage No. 2.—Eighty-three cutworm larvæ put in (fourth, fifth, and sixth instars). Seedlings sprayed freely with calcium arsenate, 1 lb. powder shaken up in 8 gallons water.

Cage No. 3.—Eighty-three cutworms put in (fourth, fifth, and sixth instars). Seedlings untreated—control.

The following morning the cages were lifted, the cutworms searched for in the soil and removed. A considerable number could not be found because of the area to be worked over and the burrowing habit of the larvæ. Results are given to fifth day; after that the cause of death is uncertain.

Experiment No. 1.—Exposed one night only, afterwards fed on pigweed.

TABLE IX.

Day.	Paris Green Bait. 1lb. to 24lb. Bran.			Calcium Arsenate Spray. 1lb. to 8 galls. Water.			Control.		
	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.
First	41	35	76	65	2	67	69	1	70
Second	26	15	..	53	12	..	65	4	..
Third	19	7	..	41	12	..	62	2	..
Fourth	14	5	..	32	9	..	55	7	..
Fifth	8	5	..	29	3	..	51	4	..
Recovered dead on fifth day—Per Cent. ..	89·5			56·7			26·0		

Experiment No. 2.—Repetition of Experiment No. 1, but exposed to baits and poison for three nights instead of one.

TABLE X.

Day.	Paris Green Bait. 1 lb. to 24 lb Bran.			Calcium Arenate Spray. 1 lb. to 8 galls. Water.			Control.		
	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.
Fourth	7	53	60	59	15	74	75	2	77
Fifth	4	3	..	52	6	..	73	1	..
Recovered dead on fifth day—Per Cent. ..	93·2			30·0			5·2		

* A type of cage made to the specifications of Mr. L. M. Hodge, manager of the Cotton Research Farm, Biloela.

It will be seen that spraying the leaves of seedlings with poison was not nearly so effective in killing the cutworms as the poison baits, and spraying has the added disadvantage that the leaves are considerably damaged by the caterpillars before the poison stops them.

The following experiment was carried out to determine the effect of different concentrations of Paris green poison in baits. The same cages were used but gauze bottoms were tacked on so that a complete recovery of cutworms after exposure was effected. Loose soil was provided for them to burrow into and pigweed was liberally given.

Experiment No. 3.—Cutworms exposed to poison bait and natural food for one night, then fed pigweed only, for five days.

TABLE XI.

ONE HUNDRED LARVÆ PER CAGE.

Day.	Paris Green Bran Bait. (1 lb. P.G. to 32 lb. Bran.)		Paris Green Bran Bait. (1 lb. P.G. to 40 lb. Bran.)		Paris Green Bran Bait. (1 lb. P.G. to 48 lb. Bran.)		Control. (Pigweed and Moist Bran.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First	74	26	89	11	92	8	99	1
Second	34	40	42	47	45	47	94	5
Third	22	12	27	15	28	17	92	2
Fourth	14	8	15	12	15	13	90	2
Fifth	9	5	10	5	13	2	86	4
Dead fifth day—Per Cent.	91·0		90.0		87·0		14·0	

Experiment No. 4.—Paris green bran bait, and calcium arsenate bran bait compared. Cutworms exposed to poison bran baits and pigweed for one night only, then fed pigweed.

TABLE XII.

SIXTY LARVÆ PER CAGE.

Day.	Paris Green Bran Bait. (1 lb. P.G. to 16 lb. bran.		Paris Green Bran Bait. (1 lb. P.G. to 24 lb. bran.)		Calcium arsenate bait. (1 lb. C.A. to 16 lb. bran.)		Calcium arsenate bait. (1 lb. C.A. to 24 lb. bran.)		Control. (Pigweed and bran only.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First ..	38	22	40	20	54	6	58	2	59	1
Second ..	25	13	23	17	24	30	47	11	57	2
Third ..	12	13	11	12	10	14	22	25	56	1
Fourth ..	9	3	10	1	4	6	17	5	54	2
Fifth ..	8	1	8	2	2	2	14	3	52	2
Dead fifth day Per Cent. ..	86·7		86·7		96·7		76·7		13·4	

All the foregoing experiments were carried out with larvæ in the later instars, fourth, fifth, and sixth, so a few experiments were tried with small larvæ. A very limited number of larvæ was available for this work, so the number per experiment is small. The experiments had to be carried out in glass jars owing to manipulation difficulties.

Experiment No. 5.—Cutworms in instars I., II., and III., exposed to poison baits and pigweed for one night. Bait was more moistened than that used for big cutworms.

TABLE XIII.—TWENTY-THREE LARVÆ PER JAR.

Day.	Paris Green Bran Bait (1 lb. P.G. to 24 lb. bran).		Paris Green Bran Bait (1 lb. P.G. to 24 lb. bran).		Paris Green Bran Bait (1 lb. P.G. to 16 lb. bran).		Control. (Fed pigweed and bran.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First	19	4	19	4	13	10	21	2
Second	11	8	5	14	13	..	21	..
Third	11	..	5	..	8	5	21	..
Fourth	7	4	2	3	1	7	20	1
Fifth	4	3	1	1	..	1	18	2
Dead fifth day—Per Cent.	82·6		95·7		100·0		21·7	

In all cases the natural food of the cutworms (pigweed) was placed in the cages so that they could avoid the poison bait if they preferred. In the case of the controls moistened and sweetened bran was fed as well as pigweed, to check the effect of bran on them apart from the effect of the poison.

It will be seen from the tables that Paris green in strengths from 1 in 16 to 1 in 50 lb. bran is an effective poison for the larvæ of *Euxoa radians.* Calcium arsenate with bran at a strength of 1 in 24 lb. bran is slower in action than Paris green and has a lower percentage kill than any of the strengths of Paris green tried. So it would appear advisable to use the greater concentration 1 in 16 lb. of this poison.

Failure to control the smaller cutworms with calcium arsenate bran mash has been reported.[16]

The experiments (Table XIII.), although not conclusive, owing to the small number of cutworms available, certainly indicate the probability of success with well-moistened Paris green bran mash.

In recommending a bran mash for field use the following points are to be noted:—

(1) Effectiveness as control.
(2) Cheapness and availability of poison.
(3) Safety in handling poison.

Paris green is the most rapidly effective poison tested. Paris green is more poisonous to human beings than calcium or lead arsenates, but its colour strikes a note of warning which serves to draw attention to its presence. It is more expensive than the other two, but can be used in greater dilution.

In mixing a bran mash it is difficult to get an even distribution of the poison when lead and calcium arsenates are used owing to their white colour, which makes them indistinguishable in the mixture. Care and thorough mixing will of course overcome this. The green colour of Paris green contrasting with the colour of the bran quickly draws the attention of the operator to a bad distribution of the poison, and this again recommends it. A bran mash mixed with Paris green will readily be seen to be poisoned if left carelessly about, but this can hardly be said of lead or calcium arsenate.

The addition of molasses to bran mash helps to keep it in a moist, attractive condition longer than if no molasses is used.

A good poison mash would appear to be the following:—

1 lb. Paris green.
1 bushel (28 lb.) bran.
1 quart molasses.
Water to moisten to a crumbly consistency.

If no molasses is available, then salt, sugar, or syrup can be added, or the mash made without any of them. It is attractive to *Euxoa radians* without sweetening. In the case of lead or calcium arsenate being on the premises it can be used as follows:—

1 lb. calcium or lead arsenate.
16 lb. bran.
1 quart molasses (optional).
Water to moisten.

Both these baits are more poisonous than may be strictly necessary, but they are on the strong side to counteract the possibility of inefficient mixing.

In all cases bran baits should be scattered under or near the plants to be protected, and applied in the evening so as to be fresh and attractive during the night when the cutworms come out to feed.

In the field in Queensland, Paris green bran bait and calcium arsenate bran bait (as recommended) have been used with complete success against *Euxoa radians* Guen., *Agrotis ypsilon* Rott., and *Heliothis obsoleta* Fabr.

Quantity of Bait Required in Rows.

In order to test the quantity of poison bait which would effectively cover the ground in the rows under the plants to be protected, experiments were carried out with moistened bran.

For plants in rows, the weight of bran necessary to sprinkle along a chain was tried, and from this figure the amount of bran necessary to protect an acre can be obtained for all different widths between the rows. In the case of cotton in Queensland, the usual width is 4 feet 6 inches, so the figures for that distance will be given.

The bait has to be distributed as thinly and evenly as possible so that the cutworms when coming out to feed at night will encounter poisoned bait readily. This is the theory on which the quantity was worked out.

It is necessary to state here that cutworms were controlled in an experimental plot of cotton at Gatton Agricultural High School and College in 1924 by placing out Paris green bran bait in lumps, the size of a walnut, at intervals of about 6 feet. The cutworms were all large ones, and they seemed to be attacted to the bait in preference to their other food.

For large areas in the field, however, most rapid distribution is obtained by scattering along the rows, and on that method is based the calculation of the quantities shown below:—

Weight of dry bran per chain, thinly distributed, 22 oz. for 12 chains = 1·83 oz. per chain = 145 × 1·83 oz. per acre in 4 feet 6 inches rows = 16½ lb. dry weight bran per acre.

Weight of dry bran per chain, heavily distributed—

12 chains required 48 oz. bran
1 chain required 4 oz. bran
145 chains required 580 oz. bran
= 36 lb. per acre in 4 feet 6 inches rows.

An actual field test over 20 acres required an average of 25 lb. per acre for an even cover along the rows of cotton seedlings in 4 feet 6 inches rows. This is about half-way between the heavy and light distributions tabulated, so it is probably a safe figure to keep in mind when mixing up bait in quantity.

Amount of Bait Required in Broadcasting.

This will vary with the seriousness of the attack. If caterpillars are large, and present in enormous numbers, a fairly heavy dressing is safer than a lighter one, and vice versa.

Tests by sprinkling measured areas gave the following results:—

	Lb. per acre dry weight of bran.
Very heavy broadcast dressing	220
Heavy broadcast dressing	180
Medium broadcast dressing	100
Light broadcast dressing	50
Very light broadcast dressing	30

As in all cases of insect control, the economic problems of cost of application, against gain by the protection offered, must be worked out in each individual case, by the person interested.

Biological.

The possibility of this form of control being used in the case of *Euxoa radians* has not been seriously considered. The pest is of sporadic occurrence, so that already it is controlled save when exceptional circumstances allow it to become of economic importance. It is indigenous and has numbers of native parasites operating against it, so that it does not appear to offer a good subject for biological control methods.

Entomophagous fungi have been used in other parts of the world to attempt control of cutworms, but so far little hope is held out of that method being a successful one.

Its habits protect it from natural enemies while at the same time placing it at the mercy of soil conditions. In poison baits there is a very good local form of control which is usually cheap enough in application to warrant its use.

[TO BE CONTINUED.]

"A WEALTH OF INFORMATION."

A Home Hill farmer writes (4th October, 1930):—" . . . . From the pages of the Journal a wealth of information is to be gleaned by the man on the land. I always look forward to its arrival. . . ."

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the September issue.*]

PART II.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

DISEASES AND PARASITES OF THE SKIN.

PIGS suffer from several skin diseases (and from infestation by a number of external parasites), all more or less serious in their nature and effect, and all likely to spread through a herd if the animals are neglected. Skin diseases and parasites cause considerable economic loss in the course of the year, both in checking the animal's growth and in affecting the appearance of the carcass, for as is well known the skin is not removed from the carcass (as it is in sheep and cattle) during the process of slaughtering and dressing.

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

Diseases and parasitic affections of special interest to pig breeders are—

Sunburn or Sunscald,
Urticaria or Nettlerash,
Pigmentation,
Pruritis or Itching of the Skin,
Dermatitis,
Eczema,
Hog Lice, Fleas, Flies, Mosquitoes, Scrub Ticks,
Demodectic or Sarcoptic Mange,
Open Wounds, and occasionally Snakebite.

DEEP SEATED PARASITES.

The parasites that burrow into the skin cause intense irritation and result in rapid loss of condition, and in some instances in an anaemia of the body. The skin is also damaged as a result of the animal rubbing against fence-posts and tree-stumps, and the commercial value of the carcass is reduced even though it may not be condemned as unfit for use; in such a condition the carcass lacks its characteristic colour and presents an unsightly appearance. In some cases the flesh is quite healthy and normal if the skin is removed, but the value of that particular carcass is reduced.

It is difficult for farmers to differentiate between the various skin diseases of the pig, for, in many respects, they resemble one another. Nettlerash, or mange, for instance, are deep seated troubles, whereas sunburn and sunscald are surface complaints, yet both cause severe reddening and soreness of the skin.

Effect of Disease.

The skin of the pig in health is very sensitive, both to internal and external influences. In disease, it may be discoloured, blotched, scarred, or disfigured in patches of varying size and shape, or it may be roughened and painful, yet not actually damaged. Such abnormal conditions may result from parasites, injuries, sunburn, or from accumulations of filth and mud. Internally, abnormal conditions may result from the improper use of certain foods; simple discoloration of the skin is seen even in slight digestive derangements and fevers, but these usually are not serious and yield to the administration of a brisk purgative, to suitable dieting, and to the discontinuance of the foods responsible for the trouble.

Dirt, lice, and mange mites produce an inflammation of the skin which is sometimes referred to as dermatitis. The latter differs from eczema in not passing through definite stages such as are common in that disease and by being produced principally by external causes. Lice, owing to their relatively large size, may readily be seen by the naked eye; mange mites, of which two varieties affect the pig, are minute and require the use of the magnifying glass in their discovery, and much more energetic and protracted treatment for their destruction. Pigs are occasionally affected with a non-parasitic skin disease referred to as sucking-pig rust, sooty or pitchy mange, a condition arising from dirty sties, accumulations of mud, and decomposition of the sebaceous matter of the skin—a trouble also exaggerated by internal ailments. Internal parasites also cause an unthrifty condition of the skin, and may be responsible for all the above skin troubles.

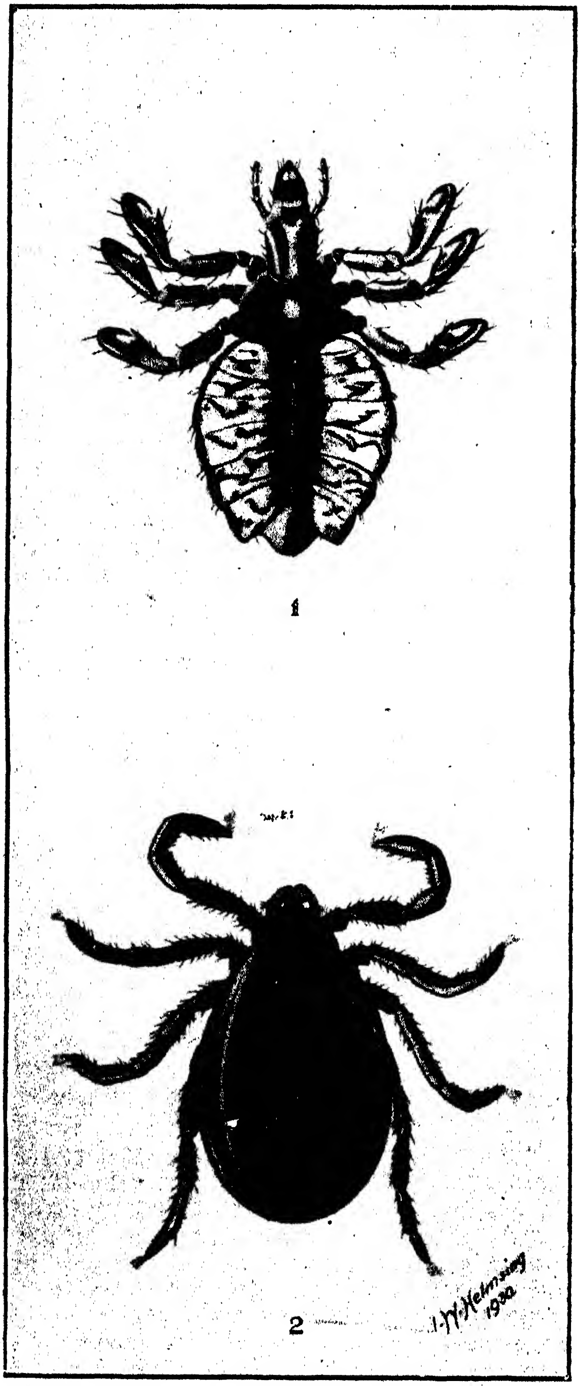


PLATE 135.

Fig. I.—Hog Louse × 10 (*Hæmatopinus suis*, Lin.).
Fig. II.—Scrub Tick × 10 (*Ixode holocylus*).

Pigs whose growth is checked by abnormal conditions (prenatal and otherwise) are usually styled "runts." It usually pays better to destroy the runts and to devote the time, attention, and food to more thrifty stock.

Meat inspectors often come across the carcasses of pigs in which the skin is blotched, freckled, or stained to such an extent as to cause the carcass to be graded as second or third class, or even unmarketable. These cases are usually classed as due to pigmentation. It is difficult to account for them, and in many instances actual cause is unknown; deep seated pigmentation in the region of the udders producing the condition known as "seedy cut" is responsible for economic losses in the bacon trade, particularly in the keener competition overseas.

Improper food may cause the carcass to be yellowish or pinkish, or to have a distinct fishy taint. Carcasses may also be soft and fail to set in cases where excess of oil is present in the food. Such carcasses are quite unsuitable for bacon, and are often of no value in the preparation of small goods. In the trade they are often referred to as "peanut-fed" pigs, though peanuts are not the only foods responsible.

ECZEMA.

True eczema is non-contagious and is an uncommon skin disease of the pig, the true form of which manifests itself by an eruption consisting of tiny reddened pimples, which later develop into blisters and pustules, which dry off and result in scab formation. These pimples may remain separated from one another or may run together and form large weeping sores which contain matter or pus, and may be the medium by which a septic condition of the skin may spread from one animal to another, as, in their endeavour to relieve irritation, the affected animals rub against fence-posts, rails, troughs, and trees.

Treatment.

For the relief of eczema, both internal and external medication is required. Commence the treatment by giving a brisk purge, followed by medicines that eliminate the waste products and toxins of the body, by way of the kidneys and the intestines.

Cleanse the skin with soap and warm water, and when dry rub in lightly a dressing of coconut or salad oil. Follow this by dressing the skin daily with 1 per cent. solution of picric acid, or with a mixture prepared as follows:—

Salicylic acid	2 drachms
Oxide of zinc	3 drachms
Coconut oil	8 ounces

Mix well and apply night and morning. Internally, medicines prepared as follows may be used:—

Recipe No. 1.—Bicarbonate of potash, 1 part; black antimony, 1 part; nitre, 1 part; sulphur, 3 parts; liquorice powder, 4 parts; fenugreek, 12 parts. The dose is from one to four teaspoonsful mixed with the food daily.

Recipe No. 2.—Another useful medicine which the local chemist would make up has its chief components: Potassium nitrate, ½ to 1 drachm; sodium bicarbonate, 1 to 2 drachms. Give as directed in food.

DEMODECTIC MANGE.

Demodectic mange is highly contagious, and is caused by a minute parasite called *Demodex folliculorum* var. *suis*. It differs from eczema in that it is caused by a parasite, wheras eczema is purely a constitutional trouble. It first shows in the form of blisters which later contain pus. The disease is most frequent in young, weakly, or sickly animals, and generally spreads over the whole body. It is exaggerated by dirty sties, accumulations of mud, and decomposition of the fatty secretions of the skin.

Treatment consists of washing the affected animal frequently with warm water and soft soap. The pigs must be kept under hygienic conditions and be given plenty of nourishing food. In very severe cases affected animals should be slaughtered without delay.

It is well to remember that mange parasites are not usually troublesome, except in cases where the animals are neglected and improperly nourished.

It must also be kept in mind that no treatment will prove efficient unless the buildings in which the stock are kept or housed are also thoroughly disinfected. The buildings should be sprayed with a solution of carbolic acid, 1 part to 300 parts of water, taking care to force the spray well into the crevices where the mange mites accumulate. The pig yards and paddocks should be thoroughly cleaned up; rubbish, corn cores, waste timber, bones, and other accumulations raked up and burnt, and the yards dug over and limed. If it can be arranged for, the pig paddocks should be ploughed and some green crop grown thereon for a season or two. Grass paddocks should be burned off and be put under cultivation before being brought into regular use again.

SARCOPTIC MANGE.

Another troublesome skin parasite, *Sarcoptic scabiei* var. *suis*, is responsible for the condition known as sarcoptic mange. Here again microscopic examination of the scurf would be necessary. The disease is first seen affecting the head, especially in the hollows of the eyes, on the eyelids, and around the ears, then over the neck, back, and inner sides of the thighs, and finally over the whole body. Early in the attack the disease will be noticed as roughened patches covered with bran-like scales, blisters, and pustules. Later these pustules develop into extensive whitish grey scabs. The skin becomes thickened,

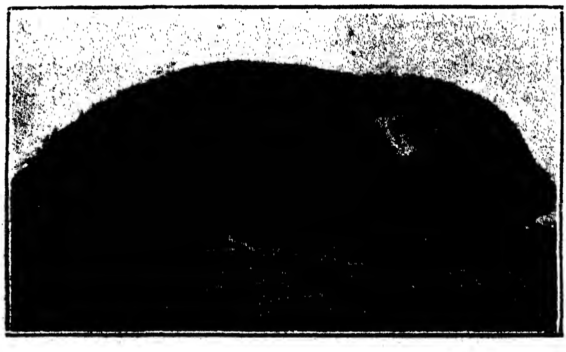


PLATE 136.—EXTERNAL PARASITES IN SWINE.
Sarcoptic scab in the pig.

wrinkled, and very tough. The bristles are loosened and fall out—sometimes they become attached and fall out in bunches or tufts. Beneath these roughened patches will be found the tiny microscopic mites responsible for the trouble. The disease is not prevalent in Australia as far as departmental records show.

Treatment.

Preventive measures are emphasised. There are several forms of treatment, and several mixtures well worth applying early in the attack. First, aim at softening and removing the scabs with warm water and soft soap. It may be necessary to give the animal several washings before the desired results are obtained. Meanwhile the pigs should be kept in a dry sty, supplied with short straw or other clean dust-free bedding. The following lotion should be applied to the skin as soon as the scabs are softened and ready for removal:—Flowers of sulphur, 3 oz.; potassium carbonate, 1 oz.; neatsfoot oil, 1 pint; mixed together while the oil is warmed slightly. Pigs should be well washed before applying the mixture.

Mange, when present in a piggery, is liable to cause considerable economic loss, for the animals, in endeavouring to obtain relief from the intense irritation, rub themselves against all sorts of roughened objects, damaging the shoulders, sides, and hams more than the belly or feet. The loss is greater than if the head, ears, or neck were the principal or only portions affected.

This damage to the carcass by roughened skin and inflammation sometimes causes the meat to be rejected as unmarketable. In other instances the injuries place the products from such pigs in a grade which has a reduced market value of from 2d. to 3d. per lb.

Treatment for sucking-pig rust or pitchy mange referred to herein consists in cleanliness, correct methods of feeding, and frequent washing of the skin with soft soap and warm water, followed by application of oil or antiseptic ointment. The following mixture is recommended:—

Raw linseed oil	1 quart
Hycol disinfectant	1 teaspoonful
Flowers of sulphur	4 ounces

Mix the flowers of sulphur with a small quantity of the oil first, then add the balance of the oil, and finally add the Hycol disinfectant, stirring the latter well into the mixture before applying to the skin. Repeat the application for several days, and keep affected animals isolated from healthy stock and under improved hygienic conditions, feeding liberally on soft, nourishing foods, allowing ample supplies of clean drinking water, greenstuff, and mineral matters.

URTICARIA OR NETTLERASH.

This disease is of dietetic or systemic origin, and causes intense irritation and inflammation of the skin. It is usually noticed in very young pigs, and is frequently associated with disorders of the digestive system (indigestion, feverishness, diarrhœa). In its efforts to obtain relief the affected animal rubs itself vigorously against fence-posts, rails, and the pen walls, and is likely to seriously injure the skin, which then becomes more readily affected by mange, sunburn, and parasites.

Nettlerash of dietetic origin is often due to over-feeding on highly concentrated foods. Such disorders must be treated by regulation of diet and the provision of succulent green foods and ample clean drinking water. In many cases there are constitutional disturbances which lead to general ill-health.

Treatment.

In addition to change of diet, strict attention must be paid to cleanliness and to the general health and wellbeing of the animals. Frequent doses of Epsom salts, light nourishing food, and plenty of clean drinking water are advised. Softening the skin and hair by regular application of cocoanut oil or antiseptic ointments will assist considerably in effecting relief.

BLOW FLY WORRY.

The ordinary blow fly, usually referred to as the sheep blow fly, is a source of considerable annoyance to live stock. The damage and irritation resultant from infestation by the larvæ (maggots) of this fly is of considerable economic importance, though, as far as the pig raiser is concerned, the loss of his revenue should be reduced to nil, provided the stock are carefully handled and efficiently controlled.

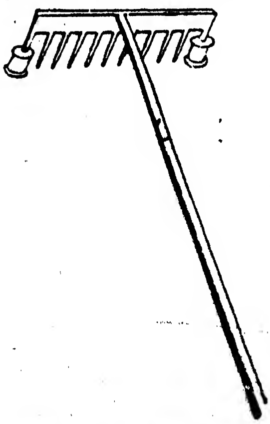
In the pig, infestation by maggots follows the attach of the fly upon wounds resultant from castration or other operations or from accidental causes. The fly deposits the living larvæ upon the wounds and they set up irritation and pus formation. Unless the animal is given immediate attention this irritation may result in serious complications.

Treatment is largely preventive or such as would prove successful in dealing with wounds of any description.

[TO BE CONTINUED.]

RAKING A LAWN.

It is difficult to rake up leaves, grass, and hedge clippings from a lawn, especially when it is composed of baffalo grass. The contrivance illustrated will prevent the teeth of the rake catching in the grass. Two cotton-reels are placed one on each



end tooth of the rake, and wedged there so that the bottom end of each reel is a little below the line of the teeth. The rake then rides easily over the grass, and collects the rubbish.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART II.

This is the second article of a series planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising on comparatively small holdings.

BREEDS OF SHEEP.

BREEDS of sheep already known in Queensland may be classified in four groups, viz.:—The Merino; English Longwools; English Shortwools or Downs breeds; and the Intermediate or Corriedale.

The Merino.

The merino is by far the most important breed of sheep in Queensland. After experimenting with stock-breeding in the early days of settlement in Australia, Captain John Macarthur concluded that sheep would thrive better in this country than any other animal, and this belief has since been confirmed by experience and results.

His small foundation flock was composed of Spanish merinos brought in from Cape Colony and was improved by later importations from England, followed from time to time by different merino types (notably the Saxony and Negretti), but the real improvement was secured after the occupation of what proved to be natural sheep country west of the Great Dividing Range. The big-framed Rambouillet was subsequently introduced and this infusion, aided by science, good flock management, and change of environment, produced a long-stapled, bulky class of wool on a large-framed, strongly constituted type of sheep. In further development, a purely Australian breed was evolved containing three distinct types, viz.—fine, medium, and strong.

Each of these groups possesses its own peculiarities, and two are adapted especially to Queensland conditions—namely, the medium and strong types. Of these, the medium forms the greater proportion and ranges over a vast extent of our pastoral territory. In the far West where conditions are exacting and animals of the hardiest constitutions are required, the strong type is favoured.

The wool of the merino is short, of fine quality, even, regular in length, of distinct character and showing a well-defined crimp according to type. In colour it is bright white, fairly well-charged with yolk which, in heavy condition, may show up as light brown. The breed is slow in maturing, but when bred and reared under congenial conditions retains its vitality to an old age.

The Longwools.

The Lincoln (Plate 139), like the Romney Marsh, was originally a Marsh breed, and, although it is now surpassed by the Romney in its ability to withstand wet conditions on low lands, it is generally considered to be hardier than either of the Leicester breeds. They cross well with the merino, and the half-bred ewes from this cross, when mated back to the merino, produce a greatly-favoured breeder for the fat-lamb trade. The Lincoln half-bred, and to a greater extent the quarter-bred, is also valuable, as a wool-producer, giving a fairly weighty fleece of good length and colour, improving in quality with the influence of the merino.

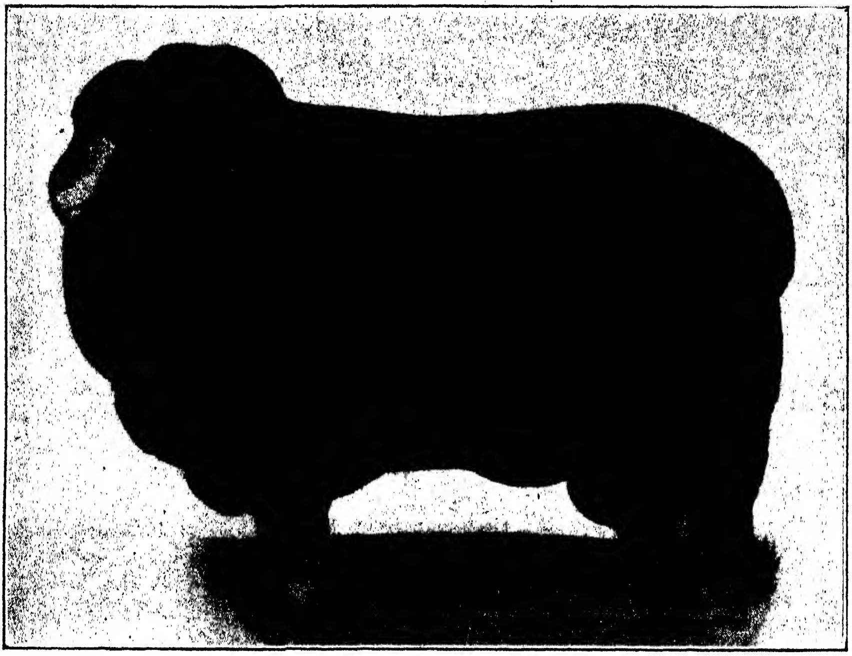


PLATE 137.—A GOOD TYPE OF AUSTRALIAN MERINO RAM.

PLATE 138.—MERINO EWES.

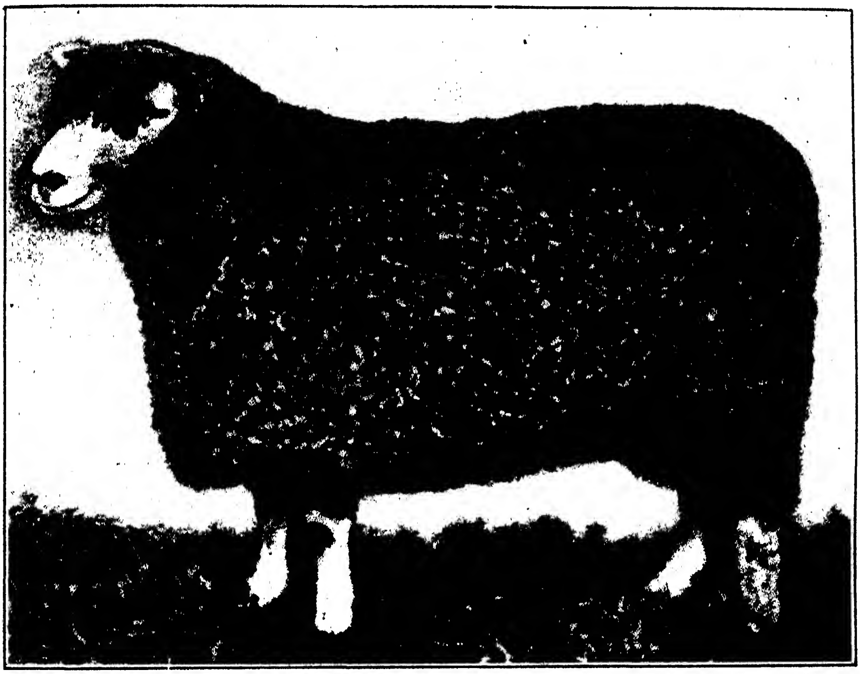


Plate 139.—Lincoln Ram.

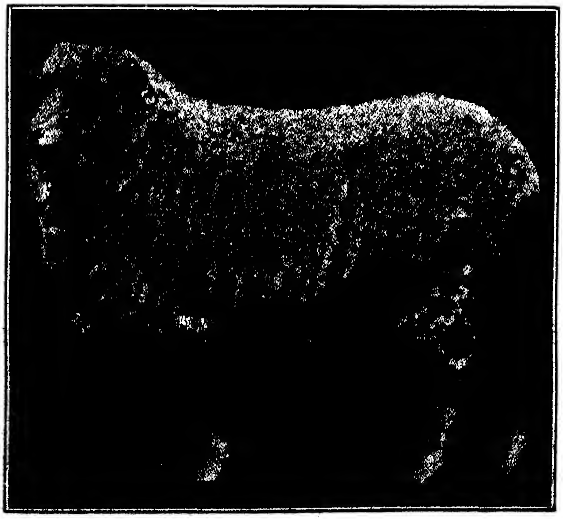


Plate 140.—Lincoln-Merino Cross.

This breed has been most favoured since its descendants in countries other than England have proved of such value in crossing for both wool production and mutton. (Plate 140.) A peculiar fact is that the half-bred Lincoln merino matures earlier and fattens quicker and easier than either of its parents.

The English Leicester (Plate 141) is another of the longwool breeds. It is an outstanding example of what can be achieved in breeding by selection.

Robert Bakewell's name stands out prominently in connection with the improvement of the Leicester in transforming it, in a few years, from a raw-boned, lanky sheep to a model of symmetry that developed quicker, and put on flesh on the most valuable parts, with a minimum amount of bone. The new Leicester was best suited to favourable conditions, and stood badly with other breeds on scanty pastures. They are not so prolific as other breeds. These defects, together with delicacy of constitution and poor milk secretion, stand against the breed to this day. They cross well with almost any breed, particularly with the merino, but more favourable conditions are necessary than for other longwool breeds. The Leicester produces a lustrous wool about 8 to 9 inches long, with a spinning quality of about 40s. The fleece weight varies from 12 to 20 lb.

The Border Leicester (Plate 142) is also a longwool breed, though the wool is not so long as that of the English Leicester, but finer in quality, and lighter in fleece weight.

This breed is really the result of a cross between the English Leicester and the Cheviot. The former was selected for its flesh production and the latter for its ability to withstand hardship, the idea being to raise a special dual-purpose sheep. The results have been a good illustration of what can be accomplished by mating suitable breeds and making the right selections. Their forequarters are full and well formed, their ribs well sprung, showing a straight square back noted more for width than depth, which gives them a high standing appearance. This with their white well-carried head, commands attention.

Considering its large frame it matures very quickly and when crossed with the merino transmits the same quality to the offspring. (Plate 143.) The half-bred ewe makes a good mother, and is specially suited to mixed farming conditions, but is more partial to higher and sweeter country than either the half-bred Lincoln or the Romney Marsh, while as breeders they do not retain their stamina for the same length of time.

These half-breeds are suitable both for the fat lamb trade and mutton. The wool they produce is of a useful type, being about 56s., in spinning counts, usually showing plenty character, and of a good colour.

The Romney Marsh (Plate 144), although a longwool breed, cannot be regarded as up to the standard of the other breeds named as wool-producers, the wool being duller in colour, shorter and showing less character. They are more of a natural grass sheep than any of the longwools; their chief feature being a strong constitution, hardiness under wet trying conditions, and their adaptability to low-lying situations. In the North Island of New Zealand the Romney has become very prominent where formerly it was thought impossible to establish sheep breeding owing to the moist conditions, and it is owing to its influence that the export lamb trade in the North Island has become so firmly established. They cross well with the merino; the half-bred ewe can be regarded as a most useful farmer's sheep. (Plate 145.)

Other longwool breeds could be quoted, but there are no conditions in Queensland which could be met by any of these breeds better, or as well as, the breeds referred to. On account of the weight of fleece that these Longwools and their crosses produce, they are more profitable to keep as breeders for farmer's flocks than the Downs breeds or their crosses. When finished with as breeders there is a

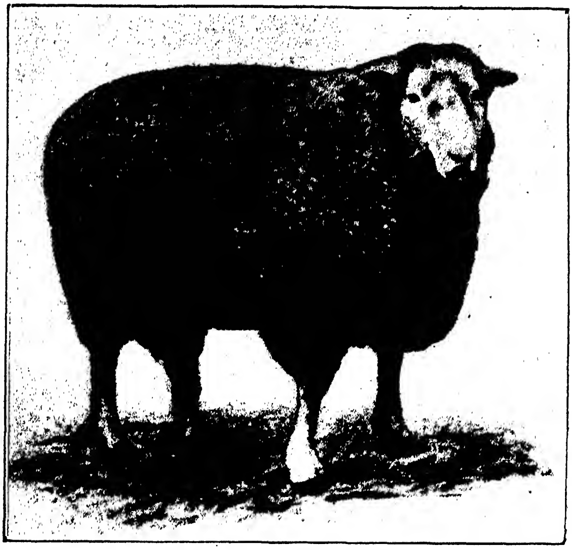


PLATE 141.—THE ENGLISH LEICESTER.

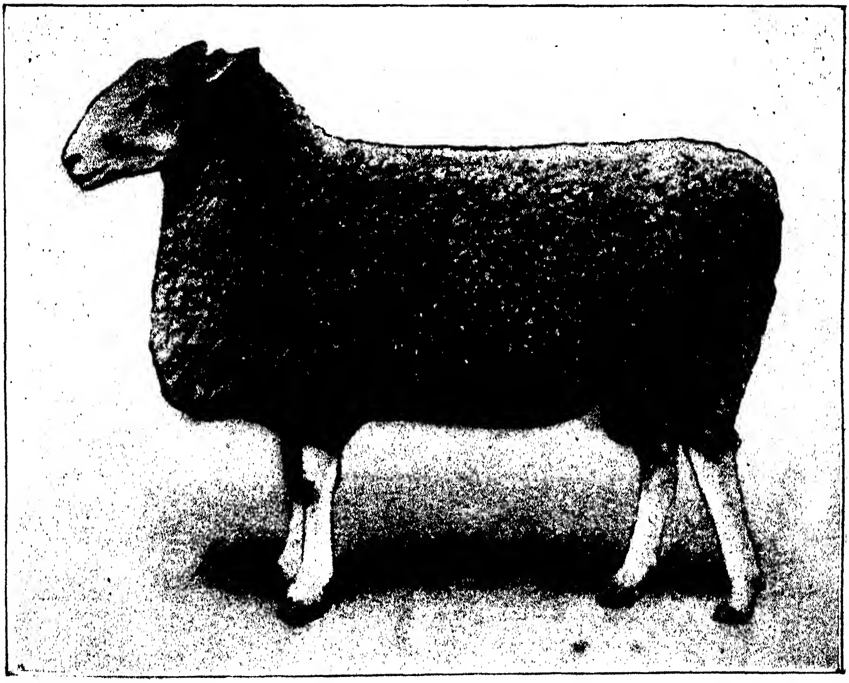


PLATE 142.—THE BORDER LEICESTER.

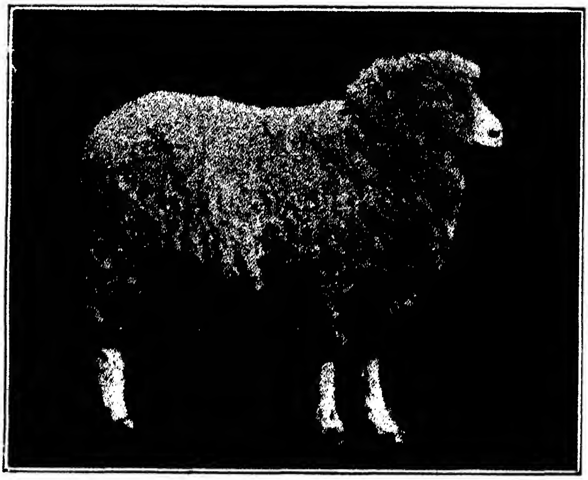


PLATE 143.—BORDER LEICESTER-MERINO CROSS.

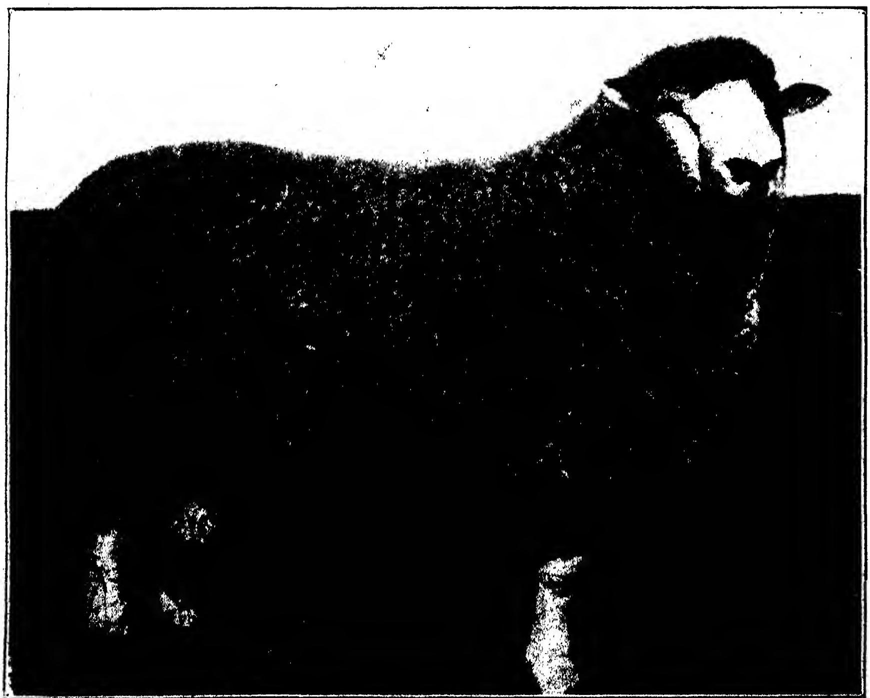


PLATE 144.—THE ROMNEY MARSH.

large carcass left for the butcher. All these points must be considered when undertaking sheep-breeding on small holdings, although the Downs breeds possess many good qualities. They are purely mutton sheep and quick maturers as lambs. As breeding ewes, however, have to be retained on holdings from year to year, the most profitable type should get preference, especially if they possess all other suitable characteristics. In breeding for the fat lamb trade, the Downs breeds are worthy of consideration.

The Downs Breeds.

The Southdown (Plate 146) is the oldest of the British Downs breeds, and has been regarded in England as producing the primest mutton. The body is uniform, broad, compact, having evenly-balanced joints, with flesh and fat evenly distributed. The lambs grow quickly and fatten easily. For our purpose they do not show sufficient merit to compensate for their lack in the production of wool. They may be used to advantage in mating with crossbred ewes for getting early-maturing lambs, but other breeds have been tried out in comparison with them and have proved more satisfactory in this respect. This with its low annual return for wool does not tend to increase its popularity as a farmers' sheep in Queensland.

The Shropshire is another of the dark-faced Downs breed. It is darker in the face and points and not so symmetrical in shape as the Southdown, but rather hardier and thrives better on a variety of pastures. In most respects, however, it is similar to the Southdown.

There are several other Downs breeds available as mutton breeds, including the Dorset Horn (Plate 147), which has proved itself one of the most suitable as a sheep giving a greater body weight and one of the earliest to mature, as also is its progeny when crossed with crossbred ewes. (Plate 148.) This is not only the result of experiments in Queensland, but also in New South Wales and South Australia.

The best results have been achieved when mating the pure Downs breeds with half-bred ewes. In following this system of mating the whole of the progeny can be disposed of as soon as fit.

The Corriedale.

Another sheep which has developed into great favour is the Corriedale. (Plate 149.) This breed was raised by crossing the Lincoln with the merino, and is now regarded as a type midway between the two breeds.

The evolution of this breed filled a vacancy in breeds required as dual-purpose sheep for farming conditions. Continually cross breeding for a given purpose does not give us anything permanently suited for the purpose, so that the Corriedale not only supplies us with sheep well fitted for farming purposes, but it gives us a lead in evolving other types, which may be necessary for other special purposes.

The Corriedale develops into a good, strong, large-framed, robust sheep which carries a fleece weight ranging from 10 to 12 lb. with spinning counts ranging from 54s. to 56s. and higher.

The breed is remarkable for the evenness of length and quality of the wool they produce. The staple should be long according to quality, bulky, full and even to the tip, showing a pronounced wave or crimp throughout. The lambs are not such quick-maturers as some of the crossbreds referred to previously, but this could not be expected when their wool-producing capacity is considered.

As a breed where wool and mutton are the chief considerations they stand out on their own as farmers' sheep in the Plateau area. The ewes (Plate 150) make ideal breeders for farmers' flocks, and are suitable as mothers for the fat lamb trade when mated with either the Border Leicester or Dorset Horn ram.

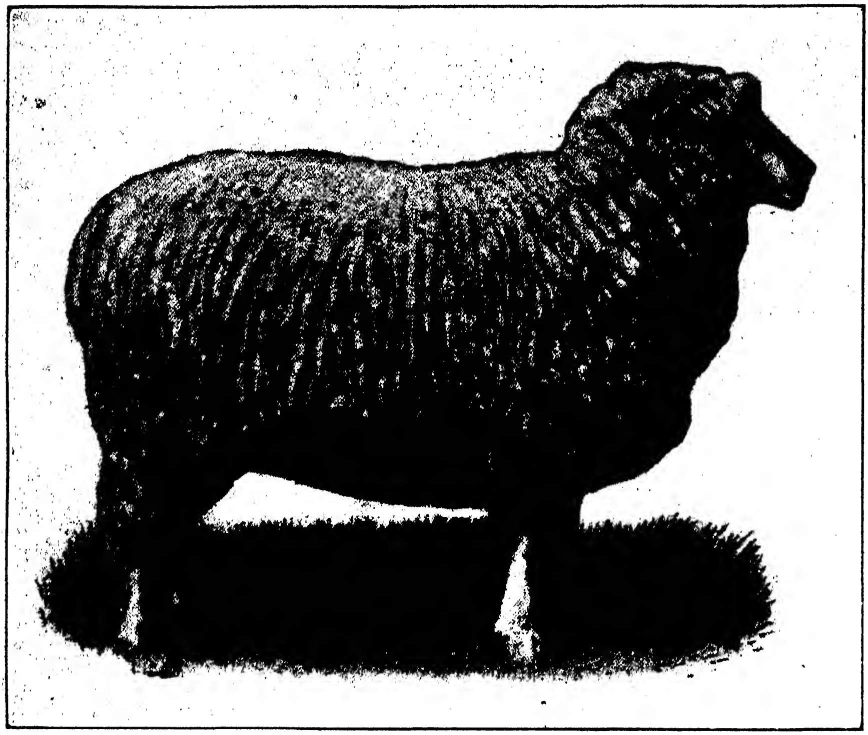


PLATE 145.—ROMNEY MARSH-MERINO CROSS.

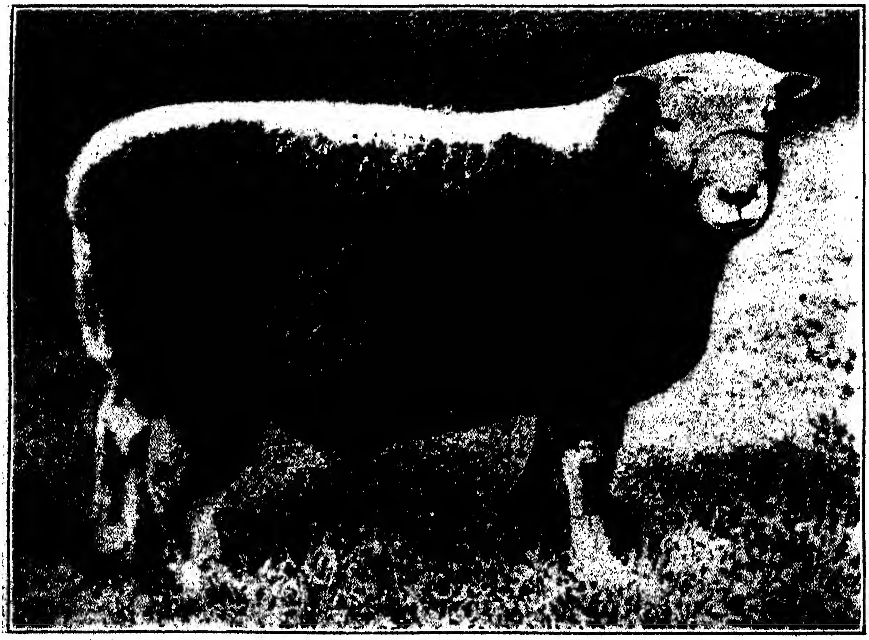


PLATE 146.—THE SOUTHDOWN.

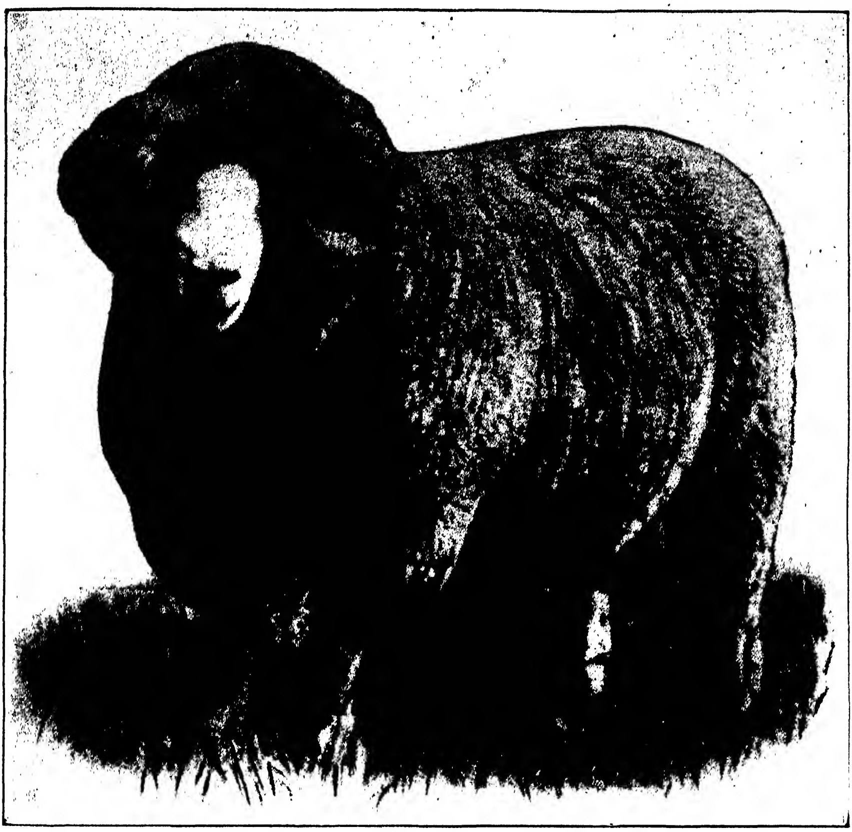


PLATE 147.—THE DORSET HORN.

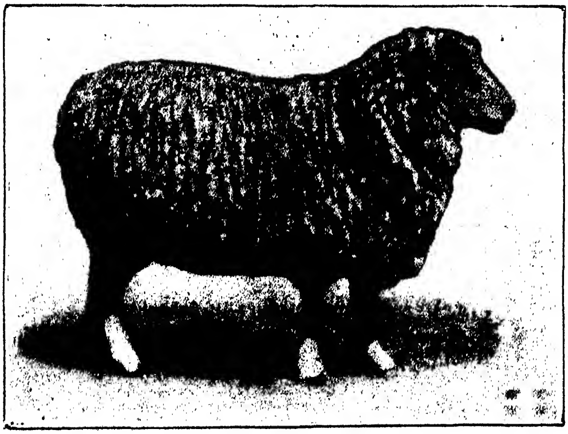


PLATE 148.—DORSET HORN-CROSSBRED CROSS.

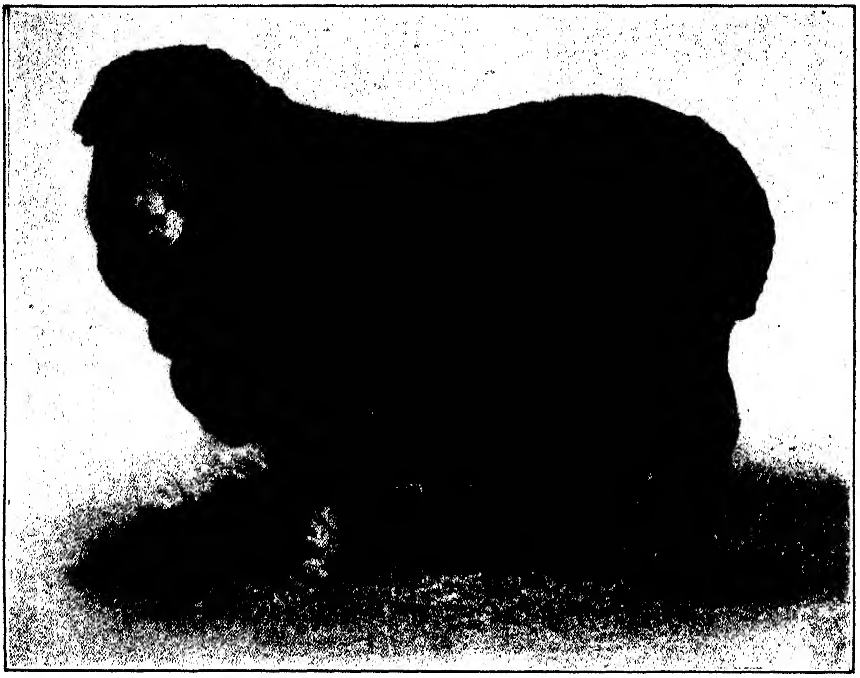


Plate 149.—The Corriedale.

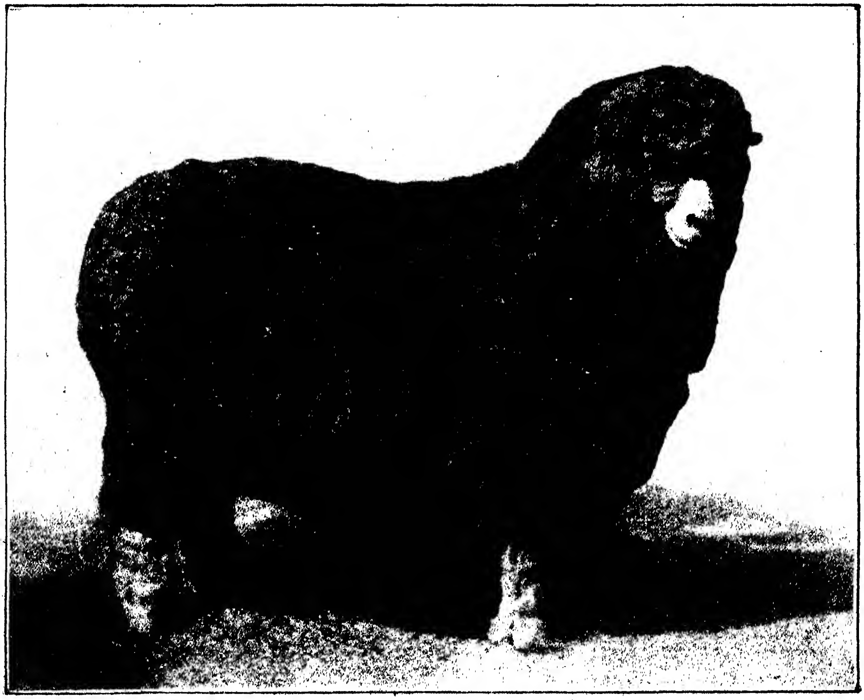


Plate 150.—A Corriedale Ewe.

RECLAIMING PRICKLY-PEAR LAND.

PASTURE EXPERIMENTS AT PALARDO.

By H. C. QUODLING, Director of Agriculture.

The remarkable success of efforts to combat the prickly-pear by biological control methods, mainly by means of the moth Cactoblastis cactorum, the caterpillars of which feed voraciously on this plant, has created interest in the question as to how land reclaimed from the pest may be brought into economic production. Accordingly a series of experiments were begun last October on a 70-acre section of belah and brigalow country near Palardo, in the Maranoa district. Various grasses and fodder plants were sown. For the greater portion of the experimental term exceptionally favourable seasonal conditions prevailed. By May every kind of plant grown had made sufficiently good progress to warrant light stocking with sheep of the area sown. Extraordinarily prolific growth followed the heavy rains of late autumn, and much heavier stocking of both cattle and sheep would have been possible. It may therefore be assumed with some justification that, after the destruction of the timber by "frilling" and poisoning (sufficient shelter belts and groves, of course, being retained), and the sowing of suitable grasses and fodders, this land may, without an unduly heavy outlay, be brought readily into profitable use.

The practical application of this system to extensive tracts of pear country now in process of being freed from the pest should have a far-reaching effect on production, particularly in relation to animal husbandry. —ED.

TO date nothing in the history of settlement in the "pear belt" of Queensland is thought to be of greater importance than the work of the Cactoblastis insect in freeing country of the pest, which at its peak period overshadowed something like 50,000,000 acres of land. The necessity was realised of following up the progressive work of the insects, which have been widely distributed by the Prickly-pear Land Commission, and of finding a means of promptly bringing the immense areas of brigalow and belah "scrub" lands into a state of productivity. With this object in view, and setting aside for the time being the forest country (where grass and herbage soon show up after ringbarking) experiments were initiated last October at Palardo, on the Western line, where the use of a 70-acre section of country was secured from Messrs. Henderson Bros. Here, as in other places, successive waves of Cactoblastis had literally flattened out the pear and reduced it to a mass of rotted and partially rotted vegetable matter, right in amongst a thick stand of trees, numbering between 200 and 400 per acre, mostly about 8 to 10 inches in diameter, with odd trees, in the case of the belah, up to 20 inches at the butt.

Other objectives aimed at in designing the experiments were:—

(*a*) To try and derive the fullest possible benefit from the large quantity of vegetable matter present.

(*b*) To avoid the immediate use of fire so as to ensure the preservation of the humus; and the various forms of insect life which had wrought the destruction of the pear in the first place, so that successive generations of insects might more effectually deal with all the following growth of pear, and, incidentally, to obviate the inevitable suckering, which takes place if brigalow is prematurely fired.

(*c*) To "frill" and poison the standing timber with arsenic pentoxide to ensure a more rapid and decisive "kill."

(*d*) To broadcast summer-growing and winter-growing grass mixtures and cover crops to permit of stocking the country as quickly as possible and making it productive in a matter of months rather than years; and in doing so, to bring about an appreciable increase in its carrying capacity.

(*e*) To ascertain the most suitable and effective strength of arsenic pentoxide solution for timber destruction; and for killing "suckers."

(*f*) To determine the best period of the year to destroy the timber, so that any suckering of the brigalow would be avoided.

PLATE 151.—AN OUTPOST OF EMPIRE. THE PIONEER SURVEYS A NEW REALM.
Typical Brigalow and Belah " Scrub " Country Interspaced with Box and Sandalwood Forest (overlooking Site of Experiment Plots).

PLATE 152.—" PEAR " GROWING ON EXPERIMENTAL PLOT SITE BEFORE THE INTRODUCTION OF COCHINEAL AND CACTOBLASTIS.

SUMMER SERIES.

In the summer series, Rhodes was chosen as the principal grass (8 lb. per acre), a small quantity (1 lb. per acre) of *Paspalum dilatatum* being added. Individual cover crops on the respective 3-acre sectional areas being Sudan grass (8 lb. per acre), White Panicum (20 lb. per acre), Japanese Millet (20 lb. per acre), French Millet (14 lb. per acre), and Giant Panicum, setaria (20 lb. per acre).

Method.

As it was out of season for timber destruction work, October to December (the usual period being from late February to July), a strong solution (30 per cent.) of arsenic pentoxide was used and applied immediately after "frilling," a fall of 2.57 inches of rain having induced a perceptible sap movement.

Seed was broadcasted by hand in the first week in December right on top of the rotting pear. At this time a few of the trees were still alive, but most were dead or dying. Sixty-five points of rain fell in November. A heavy storm, yielding 318 points, fell the first week in December. The resultant moisture induced a good germination of seed, but did not penetrate more than 3 inches of the pear mulch, the soil being still dry. In January 229 points were recorded. February was a dry, hot month, only 93 points being registered. Approximately 60 to 70 per cent. of the cover crops and young grass seedlings perished about the end of the month for want of moisture. The remainder, which had the benefit of a slight run-off from the pear, carried on until the March rains. At this period all the cover crops bore seed, which fell and germinated, only to be checked by frost in May and June. By this time Rhodes grass was well established, but the stand requires to be thickened up by natural and artificial reseeding.

Conclusions to date show that the factors which adversely affected the progress of this series of experiments were the lack of moisture in the soil and subsoil (which did not get a good soaking until May), accentuated by the heat wave in February at a time when an appreciable number of trees were not quite dead, contributory to which was the all too short a period between the time of "frilling" and poisoning the scrub trees and that of sowing the seed.

WINTER SERIES.

In this set of experiments there were six plots, each 3 acres in area.

The conditions in respect to the pear itself were practically the same as for the summer series, viz.:—The rotted and partly rotted mass ranged from 3 to 5 inches in thickness, with numerous clumps of old, dry, fibrous pear about 12 inches in height, rotting at the base, but which had not yet completely broken down and flattened out. Throughout some small patches of soil were to be noted where no pear had grown, these being found more in the belah, and were either lightly covered with short moss or with thin tufts of grass, *Panicum gracile* principally; a little creeping saltbush and roley-poley (*Anasacantha*) were also showing up at intervals.

The period of frilling and poisoning the trees, October to December last year, was practically the same as for the summer series. A few trees still showed signs of life on 10th February this year, when the seed was sown, but by 20th March, the date it germinated, the trees were to all intents and purposes dead.

Seed Mixture.

To provide for a well-balanced ration, a standard mixture was made up for this particular experiment, subsequent to testing the germinating quality of the seed, comprising—Prairie grass (10 lb. per acre), Lucerne (3 lb. per acre), Bokhara clover (2 lb. per acre), Rhodes grass (2 lb. per acre), Sheep's burnet (1 lb. per acre), and *Phalaris bulbosa*, Toowoomba canary grass (¼ lb. per acre). This mixture was sown with different cover crops for each plot, these latter being Currawa wheat (30 lb. per acre), Cape and Skinless barley (15 lb. each per acre), Algerian and Sunrise oats (15 lb. each per acre), Rye (30 lb. per acre), Canary seed (10 lb. per acre), and Dwarf Essex rape (7 lb. per acre) respectively.

Germination of Seed and Plant Development.

The seed lay on the surface at the mercy of birds and animals for a little over a month, an exceptionally good germination taking place on 20th March after the rain had carried the seed on to the rather loose but moist vegetable matter present in the interstices of the dried-out pear residues.

PLATE 153.—THE EFFECTIVE WORK OF THE CACTOBLASTIS ON EXPERIMENT PLOT SITE.

PLATE 154.—"FRILLING" AND POISONING TIMBER WITH ARSENIC PENTOXIDE. Cost 7s. 6d. per annum plus 1s. 6d. per annum for 6 lb. of poison.

Aided by an excellent season the growth was extraordinary, the taprooted plants —Lucerne, Bokhart clover, and Sheep's burnet—striking down through the decaying pear deeply into the soil, whilst all surface rooters revelled in the rich decaying vegetable matter.

Within three months there was an abundance of succulent fodder and grass in fit condition to carry stock. The lucerne and prairie by this time were 12 inches long, the cover crops being stronger and more luxuriant.

So far no stocking has been undertaken in connection with this particular series as it was necessary to allow the cover crops and grasses to mature sufficiently to permit of the yields being assessed, and to determine also whether certain of the plants would bear viable seed. The yield on the two most forward plots, where cover crops of rape and barley were grown, was taken on 9th July. The former gave a return of 14 tons of fodder to the acre and the latter 10 tons. The rainfall from January to June was as follows, the number of wet days being shown in parentheses: —January 2.29 (6), February .93 (3), March 1.89 (4), April 1.62 (3), May 5.29 (4), June 2.88 (7).

Conclusions.

The season undoubtedly was an exceptionally favourable one and much superior to the average run of seasons experienced in the district. Conditions were fairly normal prior to the heavy fall of rain in May. Observations then made showed that every kind of plant was making sufficiently good progress to warrant light stocking with sheep if it were necessary to do so. Aided, however, by the excellent rains in May, the resultant plant growth and development was extraordinary, which would have permitted fairly heavy stocking by cattle or sheep if such were expedient.

Up to the present there is some justification to assume that the frilling and poisoning of the "scrub" trees and the sowing subsequently of suitable grasses and fodders apparently offer an efficient method of dealing with this class of country. Its practical application to the extensive tracts of pear country now in process of clearing by biological means should have a far-reaching effect on production, which at a not too far distant date might be expected to find expression in the way of increases in the amount of beef, mutton and lamb, wool, dairy produce, and pork in direct proportion to the character of the development work undertaken and the kind and amount of food provided for the various kinds of stock.

PROGRESS REPORT, 1st JULY TO 30th SEPTEMBER, 1930.

Rainfall—Month.	Number of Wet Days.	Points.
July	3	91
August	4	141
September	5	87

Summer Series, 1929-30—(16 acres), comprising one 4-acre and three only 3-acre acreas.

Reference was made in the June progress report to the fact that although a good germination occurred both of grass and cover crop seeds sown during the first week of December approximately 70 per cent. of the young plants died owing to the heat wave in February. Observation showed later that the time between the killing of the timber and that of sowing the seed (five to six weeks) was too short, as the subsoil had not been wet for several months and did not fully benefit in this respect until the following May. The cover crops, although they made fair growth, were patchy. The Rhodes grass was also irregular; it, however, made excellent progress, and except for slight tip frosting kept green and succulent right through the winter, the standing timber affording a certain protection.

As reseeding by natural means would not even up this stand of grass quickly enough to keep weeds in check, the several plots were resown (3rd to 6th September, 1930) with 5 lb. of Rhodes grass per acre and Sudan 8 lb., White Panicum, Japanese Millet, Liberty Millet, and French Millet 10 lb. per acre respectively.

Winter Series, 1930—Six plots, each 3 acres in area.

PLATE 155.—SOWING RHODES GRASS AND SEED OF COVER CROPS.

PLATE 156.—COVER CROP OF WHEAT.

Seed sown, 9th February, 1930; Germinated, 20th March, 1930. Crop weighed, 29th August, 1930; Yield, 9·8 tons per acre.

Green fodder weights of cover crops used with the lucerne and grass mixture in this series (vide June report) were as follow:—

Cover Crop.	Date Sown.	Date Germinated.	Date Weighed.	Yield per Acre (Tons).
Wheat	9–2–30	20–3–30	29–8–30	9·8
Oats	10–2–30	20–3–30	29–8–30	14·4
Barley	10–2–30	20–3–30	9–7–30	10·0
Canary Seed	11–2–30	20–3–30	7–9–30	14·4
Rye	11–2–30	20–3–30	29–8–30	11·2
Dwarf Essex Rape	12–2–30	20–3–30	10–7–30	14·0

Photographs of several plots appear in the letterpress.

SUMMARY.

Conclusions drawn to date from this, the first winter series of experiments are, that the method of frilling and poisoning the timber and of sowing seed on top of the rotting pear, offered a practical means of making profitable use of this class of country quickly. It also demonstrated that, although the seeds and grain were variable in character, size, and weight, each kind germinated satisfactorily without covering of any kind, on a rough, uninviting surface; however, the latter's virtue and richness, like many things in nature, lay dormant immediately below it. Fairly heavy seeding was adopted as loss of seed and young plant life seemed inevitable.

Surface and tap-rooted plants were chosen to provide, as far as possible, for a balanced ration to fatten stock quickly; for drought resistance, also for permanent pasture plants which would persist after those of annual habit had served their purpose. Modification both in the quantity and variety of seed appears necessary, if only from the standpoint of cost.

Feeding Off.

Thirty-four acres comprising the first of the summer (16 acres) and winter (18 acres) series of experiments was stocked with cattle of mixed sexes, principally growers; those of fattening ages being limited in number.

DETAILS OF STOCKING.

Date Put On.	Kind.	Number.	Date Removed.	Kind.	Number.	Remaining until 22nd October, the Date of Sale.
12–9–30	Cattle	58	29–9–30	Cattle	30	Cattle 51
12–9–30	Horses	4	29–9–30	Horses	4	Cattle 3 (House Cows)
17–9–30	Cattle	26				

Cattle were in fair to forward condition when stocking of plots commenced 12th September, 1930. Eighty-eight were drafted on 29th September and 51 (34 steers 2½ to 4 years and 17 heifers and cows 3 to 4 years) in more forward to half fat condition put back to fatten and to remain until 22nd October, the date fixed for a local cattle sale.

Preference was shown for the different grasses and cover crops in the following order:—*Phalaris bulbosa,* Prairie grass, and Lucerne were grazed right away; then Canary seed, oats, wheat, barley, rye, and lastly Dwarf Essex rape. The cattle naturally paid more attention to the crops than to the Rhodes grass. It was observed that the amount and variety of fodder available soon effected an improvement in their appearance and condition.

At the time the cattle were introduced the Rhodes grass in the summer series was well established, up to about 18 inches in height, and as a result of the protection afforded by the standing timber and the volunteer growth of "milk" thistles and herbage, it was still soft and succulent and unaffected to any notable degree by frost.

37

PLATE 157.—COVER CROP OF BARLEY (CAPE AND SKINLESS).
Seed sown, 10th February, 1930; Germinated, 20th March, 1930. Crop weighed, 9th July, 1930; Yield, 10 tons per acre.

PLATE 158.—COVER CROP OF OATS.
Seed sown, 10th February, 1930; Germinated, 20th March, 1930. Crop weighed, 29th August, 1930; Yield, 14·4 tons per acre.

Extension Work to Embrace the 1930-31 Season.

The original experiment area of 70 acres was increased to 134 acres, two seasons' operations being deemed necessary to provide for confirmation of present data, conditions on the new section being to all intents and purposes similar to those on the old.

Frilling and Poisoning of Timber.

This was done by contract on 64 acres at the rate of 7s. 6d. per acre. Work was commenced the second week in July and finished on 2nd August, a 20 per cent. solution of arsenic pentoxide was applied immediately the trees were frilled, by means of an atomiser (stainless steel); a short length of rubber hose (2 feet 6 inches), acorn nozzle and trigger control being substituted for the standard atomizer fitting. Six pounds of arsenic pentoxide per acre were used. Rhodamine B being added as a colouring agent to the poison, the cost of which latter was under a half-penny per gallon.

The sap was free, the soil and subsoil moist and the brigalow trees were in flower whilst the above work was in progress.

An excellent "kill" appears to have been obtained, the trees showing the effect of the poison within a few days of its application.

Half of this area is being reserved for the 1931 winter series of experiments.

Seeding Operations 1930-31 Summer Series.

Four plots, each approximately 8 acres in area were sown, 11th to 13th September, with the following mixtures, the seed being broadcast on top of the rotting pear to await sufficient rain to germinate it. Quantities per acre and price per lb. shown in parenthesis—

Rhodes grass (5 lb., 1s.); Sudan grass (8 lb., 5½d.); includes 3 acres Star Leaming maize (50 lb.).

Rhodes grass (5 lb., 1s.); White Panicum (10 lb., 6d.).

Rhodes grass (5 lb., 1s.); Japanese Millet (10 lb., 3d.).

Rhodes grass (5 lb., 1s.); Liberty Millet (Setaria) (10 lb., 3d.).

In order that comparison might be made between this latter section, seeded six weeks after the timber was poisoned; and another where the timber was poisoned last March, duplicate plots four in number, each 7 acres in area, were seeded 3rd to 6th September. Additionally 5½ acres were divided into three irregularly-sized plots and sown with Rhodes grass alone and Rhodes grass with cowpeas and Soya beans respectively.

Percentage Poisoning Tests.

Contiguous areas, thickly timbered, principally with brigalow, were chosen for this experiment, each approximately one-sixth acre in size, all conditions being comparable.

"Frilling and poisoning" was acrried out in March. The following percentages were used:—2½, 5, 7½, 10, 12½, 15, 17½, and 20. The weaker solutions did not appear to be as efficient as those ranging from 10 to 20 per cent. The "kill" effected by the 20 per cent. solution was, however, very decisive in character and was consequently adopted as the standard for all subsequent poisoning work and in this its efficiency was confirmed. The per cent. tests cannot be regarded yet as final.

Monthly Poisoning Tests.

In this series, sections each 1 acre in area were poisoned monthly throughout the year. In October and November there was a slight tendency of the brigalow to sucker from the main roots, at a short distance from the butts of the trees. The soil and subsoil at this period was more or less dry. These suckers, when several inches in length, were sprayed with an atomizer, a 20 per cent. solution of arsenic pentoxide being used. Three weeks afterwards they were rotten at the base. Except for the Sandalwood and Wilga, on which the effect of the poison was irregular, the trees generally were affected by the arsenic pentoxide within several days after its application. A regular count was maintained. Whip stick sized saplings, small Wilga and undergrowth were cut off close to the ground with a V-shaped cut and well sprayed, small bushes of *Cassia ovata* being similarly dealt with.

PLATE 159.—COVER CROP OF RYE.
Seed sown, 11th February, 1930; Germinated, 20th March, 1930. Crop weighed, 29th August, 1930; Yield, 11·2 tons per acre.

PLATE 160.—COVER CROP OF CANARY SEED.
Seed sown, 11th February, 1930; Germinated, 20th March, 1930. Crop weighed, 7th September, 1930: Yield, 14·4 tons per acre.

PLATE 161.—COVER CROP OF DWARF ESSEX RAPE.
Seedsown, 12th February, 1930; Germinated, 20th March, 1930. Crop weighed, 10th July, 1930; Yield, 14 tons per acre.

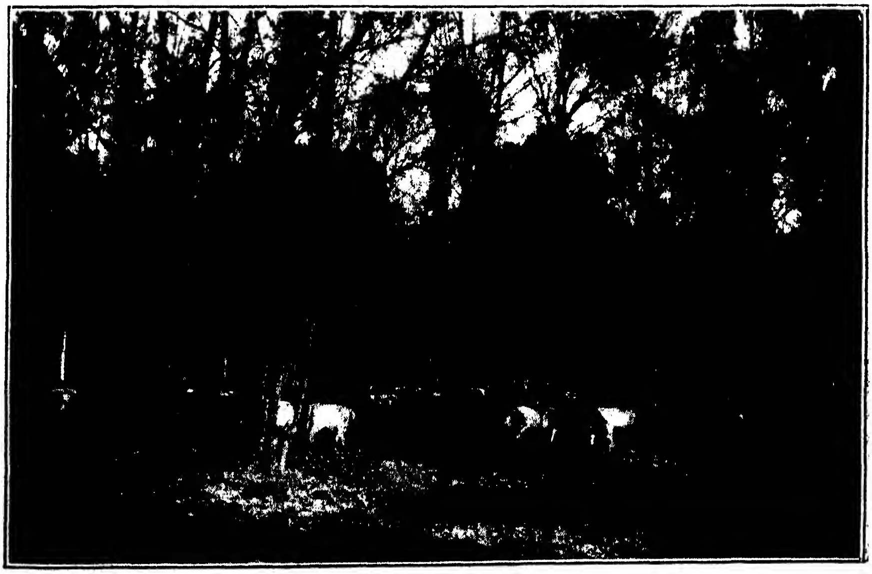


PLATE 162.—FEEDING OFF THE PLOTS.

Observation showed that the most important feature of any poisoning work is to carry it out almost simultaneously with the axe cut. Efficient axe work is also necessary; an "open frill" is desirable and should be made with a series of clean, sharp axe cuts, a wrench of the wrist being given as each chop is delivered, to free the outside of the sap wood and bark from the tree.

In this district the most promising period for timber destruction appears to be from late February to July. When the soil is moist and the sap is quite free, it may be extended into August, particularly in the case of late flowering trees.

Other Poisoning Work.

Boring ¾-inch auger holes close to the ground in the butts of a limited number of brigalow trees and filling them with "poison" was tried, but the only effect was to kill a narrow strip of bark, about 2 inches in width up the trunks of the trees.

A similar test was carried out with trees that had suckered after being frilled and poisoned, by boring directly into a main lateral root, at its junction with the trunk of the tree. This was equally as ineffective. There is no merit in either process.

Poisoning Box Trees.

Early in August the following tests were initiated:—Ringbarking alone (10-inch band); ringbarking and immediately spraying the sap wood with an atomizer, using a 20 per cent. solution of arsenic pentoxide; ringbarking and frilling combined; ringbarking, frilling, and poisoning; cutting box saplings down close to the ground with a V-shaped cut and spraying the cut surfaces with poison. Time is required to complete the tests.

Acknowledgments.

This department's thanks are tendered to Mr. J. B. Henderson, O.B.E., F.I.C., for the excellent photographs used to illustrate this progress report; also to the members of the Prickly Pear Land Commission for supplying, free of charge, all the arsenic pentoxide used in the experiments.

CARE OF THE CAR.

Springs make riding in a road vehicle at high speed possible; without springs the motor car would shake itself and the passengers to pieces within a very short time. Three types of springs are found in most cars to insulate the passengers from the shocks caused by the car striking bumps in the roads. These springs are the resilient tyres, the main springs, and the springs in the upholstery.

The Tyres.

The pneumatic tyre is an excellent form of spring, and performs the very vital function of eliminating almost entirely the quick, short vibrations that otherwise cause the whole car to vibrate. The old high-pressure tyres performed this function in part, but the modern balloon tyre does the job very thoroughly indeed. For example, it is possible to drive over a road the surface of which is loose gravel, and to feel not the slightest tremor within the car.

Not only must the springing be considered as a means of protecting the passengers, but also as a means of protecting the car. The wheels and axles are protected by the tyres only, and, therefore, are referred to as unsprung weight. While on the subject of tyres it might be well to mention the marvellous progress that has been made towards perfecting the tyre in the last few years. High-pressure tyres have been superseded by ballon tyres, and the 1930 tyre is less liable to blow out, and wears longer than any of its predecessors. The latest reports from abroad indicate that in a little time decorated tyres coloured to harmonise with the body of the car will be on the Australian market. No doubt the lady motorists of the near future will select the footwear of their motor cars and be influenced in doing so by the prevailing fashions.

The Main Springs.

The casual observer of progress in motoring would probably give most credit for the excellence of the modern car to its excellent engine. The writer is of the opinion, however, that the outstanding feature of the modern car is its comfort and stability on the road. Comfort and stability are essentially matters of spring design and distribution of the weight of the car. Springs on modern cars vary considerably in their design. The transverse spring, as its name implies, is one that is fixed across the car. The "Ford" is the best known car containing this type of springing. It has the virtue of being a cheap, simple construction, which gives good springing and excellent road holding to the car.

The full elliptic spring is one that is like a complete ellipse. This type of spring is unusual on modern cars, but is commonly seen on horse-drawn vehicles. The construction is expensive, and although the springing is excellent, good results are obtained from simpler systems. The "Franklin" car still retains this rather elaborate system of springing, and is renowned for its comfort.

The semi-elliptic spring is the usual type used on motor vehicles. In this type of spring the axle is clamped to the centre of a bow-shaped spring, either end of which is fastened to the frame. It is usual for one end to be fixed and the other end to be fastened through a shackle link. This loose coupling of one end is essential since the spring straightens out and therefore lengthens when a bump is taken.

The quarter elliptic spring is probably the simplest type of main spring found on the car. One end of this type of spring is clamped to the frame of the car, and the other end to the axles. No shackles are needed since both ends are rigidly clamped. This type of spring has been intensively used in England, and if it is correctly designed, it gives excellent results, although there is a tendency among car manufacturers to discontinue the use of this spring.

The cantilever spring is only found on the rear axle of some cars, and as its name implies, works on the principle of a cantilever. The spring is really a semi-elliptic spring used upside down. The axle is fastened to the back end. The middle is fastened to the frame of the car through a bearing, and the front end is also fastened to the frame of the car. The "Rolls Royce" car and other high-grade machines use this type of spring.

It is the aim of all designers of motor cars to reduce the unsprung weight in the car. In almost all cars the tyres, wheels, and axles are unsprung weight, and also the portion of the spring that is fastened to the axle. With semi-elliptic springs the heaviest portion is fastened to the axle, whereas with cantilever the lightest portion is fastened to the axle. However, this advantage is offset by the fact that some form of torque tube or stays must be provided to prevent the axle from twisting under the influence of the driving force, and thus the unsprung weight is augmented.

The quarter elliptic spring has little unsprung weight, but because of its design, allowance must be made for the front axle moving forwards and the rear axle backwards when the springs are depressed.

Many drivers neglect the springs and the shackle bearings of their cars for months at a time, although they see to it that the engine is well oiled. These drivers must fail to realise the amount of working done by the springs and shackles. It is only necessary to drive behind or beside another car that is passing over a reasonably rough road to notice the tremendous work done by the springs. The wheels are constantly shooting up and down, while the body moves along comparatively steadily.

The ordinary spring consists of several leaves of high-grade steel. These leaves slide over one another when the spring is flexed. The spring should always be kept oiled, so that this sliding motion is not hampered by friction. A dry spring not only wears, but also produces an unpleasant squeaking noise.

Some drivers believe in keeping the springs dry, so as to make them act as shock absorbers. This is a foolish policy, for if shock absorbers are desired they should be fitted rather than an attempt made to force the spring into a service for which it was never intended.

Most modern shackle bolts require oil or grease, which should be injected regularly. There are, however, a number of rubber and fabric shackles in use to-day which do not require greasing. Mention was made at the beginning of this article of the springs in the upholstery. These springs do not concern the motorist very much until the covering of the cushions is worn through; the spiral springs of the seats are then likely to have a disastrous effect on the clothing of those who sit upon them.—"Radiator," in the "Farmer and Settler."

AUSTRALIAN TRADE WITH THE EAST—I.

By Colonel D. E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Colonel Evans, who is well known in Brisbane commercial and professional circles, were made in the course of a recent visit to Japan, Korea, Manchuria, and China, and will be read with much interest by all concerned with the expansion of Australian trade with the East, especially in relation to our primary products.

THE impression formed on my recent visit to the East was that Australia could get further trade. Japan has no great potential wealth other than the industry of her people. Manufacture is carried out mainly from imported raw material (other than silk) and the finished article is exported. It is on the wealth of Japan's labour that they have to depend, most foodstuffs being bought from outside. Korea supplies a good deal of these, but large importations of rice and other foodstuffs are made from outside countries. While being shown over the Yokohama Earthquake Memorial Museum, the Mayor brought under notice a chart showing assistance given in relief, and pointed out that Australia, on a population basis, gave more relief than any other country. Samples of the relief goods were on view, including Australian canned beef and condensed milk. It was remarked by a Japanese that it was a pity these brands were not available in Japan at present, because the people would like to trade with Australia. Tinned foods receive a ready sale in Japan, but the origin is generally America.

Hardwood.

Japan has little or no cheap hardwood timber, and softwood timbers are being used for sleepers on the railways. It would appear that a good hardwood timber business could be worked up in this country. This also applies to China and Manchuria.

Primary Products.

Manufactures from Australia generally have little chance in competition with the cheap labour of the East, except where the primary product can be favourably produced in Australia. For instance, Australia has a big export to the East of flour, butter, and meat, which are very favourably received. Japan takes our wheat and manufactures her own flour, but Southern China, Dutch East Indies, Malay States import our flour direct.

Beautiful fruit is grown in North China and Japan, and is plentiful, but as we have the opposite seasons a fruit trade there is possible.

Australian fruit is beginning to find a market in Java, and if proper care in selection and shipping is exercised I predict a steady increase in trade.

Queensland hams and bacon are favourably received in the East, but we should be able to get more of the trade.

The Eastern races are fast acquiring Western ideas in dress, customs, and foods, and it is mainly the latter that presents the greatest opportunity to Australia.

Owing to the prevalence of disease in the East, and the insanitary method of growing vegetables, it is not safe to eat vegetables that are not cooked. From Hongkong north this trade is supplied from America. Australia is in a good position to supply these needs, and a ready trade is available to countries north of Australia, while good shipping facilities exist between here and Singapore.

With the wide climate variations that exist from North Queensland to Tasmania, we can grow practically all the requirements of our northern neighbours, and our seasonable products are marketable in North China and Japan at a time when there is no competition, except where costly cold storage is necessary to market goods out of season.

It is not necessary to mention wool (Japan is already one of Australia's largest buyers), but only to say, when China becomes peaceful and settles down, I predict she will be a big buyer, as the many millions in North China, with their severe winters, are sadly in need of warm clothing.

PLATE 163.—PRIMITIVE TRANSPORT IN MANCHURIA. THE FAMOUS ONE-WHEEL CART UTILISING THE SAIL.

PLATE 164.—COUNTRY FOLK IN MANCHURIA ENJOY AN OUTING.

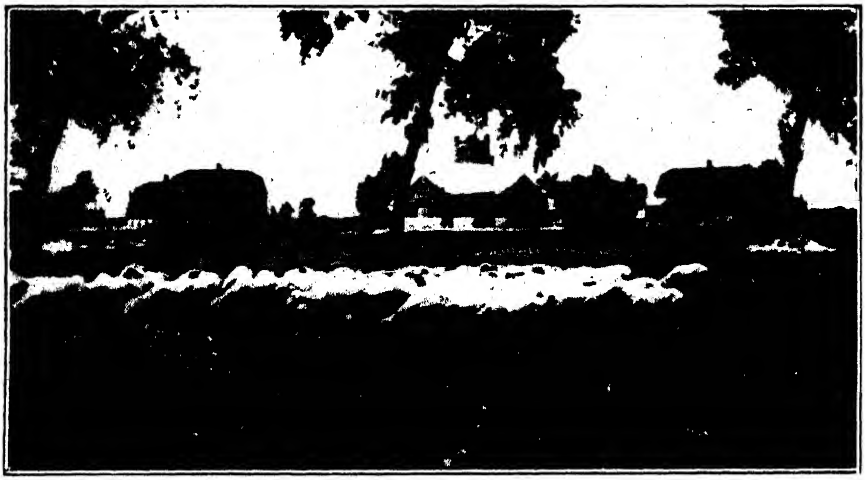


Plate 165.—Agricultural Experiment Station at Kungchuling, South Manchuria.

Plate 166.—Experimental Koaliang Plantation at Kungchuling.

Manafactures—Labour Conditions.

Speaking of manufactured articles generally, I see little chance of capturing trade in the East.

Information on labour conditions may be of interest. In Japan the average wage of male labour is about 3s. a day; child labour to women workers range from 4d. to 2s., working in most cases ten to twelve hours a day, and in the various industries can be considered good labour, although in heavy manual work would not be as good as Australian labour working for commercial firms. In Korea and Manchuria and China generally, good male labour is available for 1s. 6d. a day; child and female labour 4d. to 1s. a day, working twelve hours a day. In Shanghai children eight to ten years of age working in textile factories often walk 6 miles to work, making 12 miles walking and twelve hours working. A Chinese engineer in charge of a large textile factory employing 4,500 people informed me that his heart went out to these poor Chinese girls, who, working under the conditions stated, would sometimes fall asleep at their work and be discharged. Under conditions such as these the Australian manufacturer has little chance in competition.

In Korea and Manchuria, where they have large concessions, the Japanese have not been able to absorb their over-population, mainly because Chinese labour is cheaper, and the Japanese, having a higher standard of living, are unable to compete.

Plate 167.—A Broad Rice Field in Manchuria.

Trade.

Conditions generally in the East, with the exception of Dutch East Indies, are depressed. Japan, since the war with Russia, has made wonderful progress in industry, and during the Great War built up organisations in industries which were kept going to full capacity until a few years ago. These industries absorbed the large increased population, but with the world-wide depression many of the large industries are only working at half usual capacity, consequently much unemployment now exists in Japan.

China is in such an unsettled state with civil war—the armies mainly living on the industry of the people—that there is no stability of trade outside British territory and international concessions. Payments from the Government are delayed, and there is a general lack of confidence.

Singapore, Malay States, and neighbouring countries depending largely on tin and rubber, are feeling very much the drop in prices; but, unlike our position with wool, the prices obtaining will still allow the industry to be profitably continued in most cases.

In all these places the very prosperous times enjoyed for several years are reflected in the great improvements in private and public services. Beautiful and substantial buildings have been erected, and roads, harbour improvements, &c., give indication of money in plenty; but the general opinion now is that their products have reached the lowest values, and that in future conditions will be more stable.

[TO BE CONTINUED.]

OBITUARY.

ALBERT H. BENSON.

Queensland horticulturists, as well as those engaged in other branches of rural industry, lost a good friend in the late Albert H. Benson, M.R.A.C., who died in Brisbane on 16th October. Formerly Director of Fruit Culture in the Department of Agriculture and Stock, Mr. Benson retired from official life under the age limit provisions of the public service in March, 1927. Since then he had been associated in active partnership with his son, Mr. Harry Benson, in banana-growing and dairying at Kandanga and Brooloo.

The late Mr. Benson was the only son of the late Joseph Benson, a pioneer Queensland squatter in the Burnett district during the fifty's of last century. He was born near Taunton, in Somersetshire, England, on his father's estate, and was educated at Taunton College and the Royal Agricultural College, Cirencester, of which he was a member and gold medallist. He had been connected with agriculture during the whole of his life, and was a recognised authority on fruit culture. Shortly after he was twenty-one Mr. Benson was given the management of an agricultural estate is East Lothian, Haddingtonshire, Scotland, a county noted for its good farming. There he gained experience in growing various farm crops and breeding and fattening sheep and cattle, as well as raising fat lambs for the English market. He occupied that position for five years, when his employer, having accepted the Governorship of Madras, decided to let all the farms that had been under his management. Having heard a very glowing account of the prospects for successful culture of fruit in California, Mr. Benson decided to go to that country, where he remained five years, and gained practical experience in all branches of the fruit industry as well as a general insight into American methods of agricultural investigation and experiment station work, besides taking a course of training at the University of California.

Mr. Benson left California for Sydney early in 1892, and was offered the position of fruit expert to the New South Wales Department of Agriculture, and was the first person in the Commonwealth to be given that title. His work was not confined solely to fruit matters, but the knowledge he had gained of American agricultural and horticultural experiment work was made use of in the establishment of the Wagga, Bathurst, Pera Bore, and Wollonbar experiment farms. The value of his work was appreciated very highly by the then Premier of the Mother State (the late Right Hon. Sir George Reid) and Minister for Agriculture (Mr. Sydney Smith).

In 1896 Mr. Benson was offered the position of instructor in fruit culture for Queensland by the late Colonel A. J. Thynne, then Minister for Agriculture. His services in this State also were not confined to the fruit industry, but included general agriculture as well. Much of his instruction in fruit culture was of a practical nature, given in the orchard itself, and included cultivation, manuring, pruning, pest destruction, and handling and packing fruit for market.

Early in 1908 Mr. Benson was sent to England as a representative of his department at the Franco-British Exhibition, and was absent for twelve months. On his return he visited Ceylon and the Federated Malay States to obtain information in connection with tropical agriculture, and pineapple

canning in particular. He resumed his duties as instructor in fruit culture early in 1909, but resigned his position at the end of March, 1910, to take up that of Director of Agriculture in Tasmania. Here his early training proved of great value, as his duties necessitated having a good general knowledge of agriculture, stock, and fruitgrowing.

In 1915 Mr. Benson returned to Queensland as Director of Fruit Culture, which position he held until his retirement.

PLATE 168.—THE LATE MR. A. H. BENSON, M.R.A.C.

On many occasions Mr. Benson acted as judge at the Royal National Shows, and he was also an honorary council steward of the association. The deceased gentleman is survived by his widow and one daughter (Mrs. E. A. Ferguson, Norman Park) and a son (Mr. Henry Benson, of Mount Kenilworth, Brooloo).

SEED MAIZE IMPROVEMENT.

By C. J. McKEON, Instructor in Agriculture.

The high quality of Queensland-grown grain is commended generally, and the standards reached are the results of many years of steady effort by Departmental plant breeders. In these notes, abstracted from the Annual Report of the Department of Agriculture and Stock, Mr. McKeon reviews the work of the past year in maize improvement.

WEATHER conditions in the early months of the maize-planting season were not generally favourable, with the result that the early crops as a whole were light. The rainfall, more especially in some of the more inland districts, was very scattered, and it was not possible for a general planting to be made. These conditions prevailed until late in November and early December, and consequently many of the crops were either light or practically failures for grain purposes. Good general rains, however, fell throughout the maize-growing districts during December, and conditions from then on were very favourable, with the result that the late-sown crop will be a good one generally.

The prices received for this season's maize were very good, considering the quantity of late market deliveries.

Although a fairly large area was again planted on the Atherton Tableland, the yield will not be heavy owing to abnormal conditions during the early part of the season. In January and February over 40 inches of rain fell, and as a result rust appeared in many of the crops. Fortunately, weather conditions improved, otherwise many of the crops would have very light.

Propagation Plots.

Propagation and stud plots were established in the Kingaroy, Mary Valley, Kilcoy, and Boonah districts. These comprised approximately 120 acres, the following varieties being used:—Improved Yellow Dent, Golden Beauty, Star Leaming, Reid's Yellow Dent, and Funk's 90-Dday.

The fertiliser trials with Star Leaming, carried out at Kingaroy the previous season, were continued this season on the same farm.

Results as a whole were very good, and some very fine yields were obtained; and although some of the early crops suffered from dry weather during tasselling, none was a failure. Weather conditions were very much favourable for the mid-season and late varieties, in fact the yields in some instances being reduced through too much rain. Good supplies of seed have been secured from the crops harvested, the quality being excellent. Several crops of Golden Beauty and Improved Yellow Dent have yet to be harvested, and further supplies of very good seed will be available, particularly from the plots of Golden Beauty.

Funk's 90-Day.

Four plots of this variety were sown, and one was not used for seed selection owing to the fact that weevils attacked the grain in the field, and by the time the crop was harvested the ears were too badly damaged to be used for seed purposes. Two of the crops gave very good yields, particularly one at Imbil. The actual yield could not be secured owing to the limited barn space not permitting of the whole of the crop being kept separate after the seed selection work was completed, but from what was threshed the computed yield was 90 bushels per acre. This crop created extraordinary interest amongst local farmers, and quite a number expressed their intention to grow this variety next season. The type and quality of the seed selected fro mthis crop were excellent, and it is pleasing to note that the reddish-tinted grains, so much in evidence when this variety was first introduced by the Department are fast being eliminated. Field characteristics have also shown a very decided improvement, the husk covering throughout the whole of these crops this season being particularly good. An ear to row test of this variety was sown, but was very badly damaged by hail when the plants were well above ground, and the stand was too irregular to be used for making comparisons of yield.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EVERY MODERN IMPROVE-MENT IS INCORPORATED IN THE "NEW ERA."
We are direct Agents for the Factory--hence you buy at direct factory prices--representing about half the price you would otherwise pay.
LOOK AT THE PRICES ! ! !
15 gallon...£4-10-0
22 gallon...£7- 0-0
30 gallon...£9- 0-0
45 gallon.£12-10-0
60 gallon.£16- 0-0
90 gallon.£20-0-0
Less 10% for Cash
Terms if required
HIBISCUS
ENTIRELY SEAMLESS CREAM CAN
Sole Agents QUEENSLAND PASTORAL SUPPLIES LTD.
Bowen St., off Ann St. (Between Fire-Brigade & Ambulance) Brisbane.

Star Leaming.

Results from these plots were on the whole very good, two of the five yielding particularly well, whilst very fair yields were obtained from the remaining three. An ear to row test plot was carried out at Kilcoy, the yields from which are shown later. In this plot the germination was very irregular, many of the rows being very thin. The uneven germination was caused through unfavourable weather conditions at the time of planting. Although good soil moisture was present and the drills were covered as quickly as possible, a considerable amount of this was lost in opening up for planting, the weather conditions being hot and dry and remaining so for some time afterwards. The propagation plot which surrounded the ear to row test plot was sown with a maize planter, and a very fine germination resulted. The type throughout the whole of the plots was particularly even, and the quality of the seed selected was splendid. This variety was again used in the fertiliser trials which were condusted on the same farm at Kilcoy as that on which the previous trials were carried out. In this season's trials the paddock was divided up into 144 plots, each measuring $\frac{1}{100}$th of an acre, eleven different mixtures being used, and the plots being randomised; each mixture was replicated twelve times, the remaining twelve plots being unmanured and used as controls.

The land received a thorough preparation, and was in very fine order at the time of planting, with a fair amount of moisture present. Weather conditions for some weeks after planting were particularly hot and dry, and a considerable number of the young plants were burnt off before good rain feli. The stand was therefore thinner than was desired, but this was uniform throughout and did not materially affect the results for comparison purposes. Weather conditions, however, improved when the plants were 1 foot high, and favourable conditions were experienced during the remainder of the growing period. During growth no difference was noticeable in any of the plants. The particulars of the yields of the various plots which are given are only tentative, as the final figures and conclusions will be arrived at by the Agricultural Chemist.

The following mixtures were used; the quantities shown being the rate per acre:—

Series marked N—100 lb. sulphate of ammonia.

Series marked ½ Ps—75 lb. superphosphate.

Series marked Ps—150 lb. superphosphate.

Series marked K—100 lb. potassium sulphate.

Series marked NPs—100 lb. sulphate of ammonia, 150 lb. superphosphate.

Series marked NK—100 lb. sulphate of ammonia, 100 lb. potassium sulphate.

Series marked NPsK—100 lb. sulphate of ammonia, 150 lb. superphosphate, 100 lb. potassium sulphate.

Series marked PsK—150 lb. superphosphate, 100 lb. potassium sulphate.

Series marked NPnK—100 lb. sulphate of ammonia, 150 lb. Nauru, 100 lb. potassium sulphate.

Series marked Pn—150 lb. Nauru.

Series marked S—50 lb. flowers of sulphur.

Series marked O—Unfertilised.

Average yield per acre of 12 plots of N series—42.9 bushels.

Average yield per acre of 12 plots of ½ Ps series—43.9 bushels.

Average yield per acre of 12 plots of Ps series—45.1 bushels.

Average yield per acre of 12 plots of K series—43.7 bushels.

Average yield per acre of 12 plots of NPs series—47 bushels.

Average yield per acre of 12 plots of NK series—42.6 bushels.

Average yield per acre of 12 plots of NPsK series—46.1 bushels.

Average yield per acre of 12 plots of PsK series—47.3 bushels.

Average yield per acre of 12 plots of NPnK series—45.7 bushels.

Average yield per acre of 12 plots of PN series—44.5 bushels.

Average yield per acre of 12 plots of S series—43.9 bushels.

Average yield per acre of 12 plots of O series—42.5 bushels.

The highest average yield was obtained from the plots treated with the PsK mixture—viz., 47.3 bushels per acre. Average yield from controls was 42.5 bushels per acre. The cost per acre of the PsK mixture was £1 15s.

Star Leaming.

EAR TO ROW TEST.

Row No.	Yield per Acre. Bushels.
403 x 191	32.9
403 x 192	57.1
403 x 193	38.0
403 x 194	30.7
403 x 195	43.2
403 x 196	53.4
403 x 197	33.6
403 x 198	39.5
403 x 199	57.1
403 x 200	54.9
Check	42.4
403 x 201	46.1
403 x 202	50.5
403 x 203	54.9
403 x 204	46.1
403 x 205	60.0
403 x 206	54.9
403 x 207	58.5
403 x 208	55.6
403 x 209	60.0
403 x 210	46.1

Note.—Rows 403 x 191 to 403 x 200, also the check row, did not germinate as well as the balance of the plot.

Reid's Yellow Dent.

Two plots, one of 10 acres and the other of 7 acres, were planted, and the results were very disappointing. The former plot made wonderful growth and yielded very well, but unfortunately this could not be used for seed purposes owing to a crop of another variety being sown alongside at practically the same time. The other plot was sown early, and consequently had to contend with dry weather until after the tasselling was finished, and the crop was naturally a light one. Sufficient seed, however, was secured for further plot work.

Golden Beauty.

All plots sown with this variety did very well, one crop in particular being outstanding in every way. None of these has yet been harvested, but the yield and quality will be excellent. The field characteristics as usual were wonderfully good, particularly the husk covering and the direction of the ear on the plant when ripening. The height at which the ears are borne was also very regular, and is more noticeable probably in this variety than any of the others. Good supplies of seed of this variety will be available for distribution this season.

Improved Yellow Dent.

Arrangements were made for several plots of this variety, but only two of these were finally planted owing to the other growers being unable to get the land ready in time. Both crops made good growth, but one of these did not cob as well as is usual for this variety owing to excessively wet conditions. This, however, should give a fair yield. An ear to row test was sown with this crop, but was badly checked during early growth through water remaining on the surface of the land. Weeds also made great headway owing to the sodden nature of the ground not permitting of inter-row cultivation being carried out for several weeks after the crop was above ground. A few rows which were not subjected to flooding made good growth, but the remainder will be too poor for comparison purposes. The other crop made excellent growth, and although rather too much rain fell during the growth of the crop a good yield resulted. The ears on the whole were fairly large and were particularly well filled. The type throughout was excellent, and a large quantity of very nice quality seed was selected.

Northern Seed Maize Improvement Scheme.

This work was continued on the Departmental plot at Burnside, Tolga. Approximately 70 acres were sown, and the results from one portion (30 acres) were excellent, whilst the yield from the other portion sown at the same time and only about 2 chains away was very poor. Weather conditions during January and February were very unfavourable owing to lack of sunshine and the continuous rain, which amounted to over 40 inches for these two months. As a result rust appeared, one portion of the crop suffering very much more severely than the other. Weather conditions, fortunately, improved, and bright, warm weather followed, otherwise the damage, not only to this crop but to a large percentage of those throughout the Tableland, would have been very severe. The type and quality of the grain on the best portion of the Departmental plot were particularly good, and the percentage of grain affected with Diplodia was very small indeed, as was also the percentage of barren plants. The crop at the time of inspection was ready for harvesting, and some very fine selections of seed were made for further plot work. Three comparative trials with this variety and a selection from the local maize were conducted, and the results were as follows:—

Farm No. 1.—Local maize—Barren plants, 13 per cent.; Diplodia, 9½ per cent.; other moulds, 4 per cent. Yield per acre, 26.5 bushels. Durum—Barren plants, 13 per cent.; Diplodia, 11 per cent.; other moulds, 4½ per cent. Yield per acre, 21 bushels.

Farm No. 2.—Local maize—Barren plants, 11.6 per cent.; Diplodia, 12 per cent.; other moulds, 5.6 per cent. Yield per acre, 54.7 bushels. Durum—Barren plants, 7.6 per cent.; Diplodia, 13 per cent.; other moulds, 5 per cent. Yield per acre, 40.6 bushels.

Farm No. 3.—Local maize—Barren plants, 2½ per cent.; Diplodia, 13 per cent.; other moulds, 13½ per cent. Yield per acre, 81.9 bushels. Durum—Barren plants, 5½ per cent.; Diplodia, 9½ per cent.; other moulds, 11 per cent. Yield per acre, 63.8 bushels.

The plots on Nos. 1 and 2 suffered from rust, and all were damaged during growth by leaf-eating caterpillars, the damage in the case of the former crop, being very severe. In the crop sown on No. 3 farm the damage to the Durum from this cause was much greater than in the portion sown with local seed.

MAMMITIS.

By MAJOR A. H. CORY, V.D., M.R.C.V.S., Chief Inspector of Stock.

Under this heading may be included all derangements of the udder which are accompanied by inflammatory changes.

Of all the domesticated animals, the cow suffers most from this complaint, due to the extraordinary development of the mammary glands, as compared with those of the original type. Increased secretory power is accompanied by increased blood supply and glandular tissue, but a decreased resistance to disease.

Mammitis may be divided into two broad classes—(1) simple, (2) specific.

Simple Mammitis.

In the first class would be included all those forms in which the primary cause is mechanical, such as injuries, overstocking, irregular or improper milking. In these cases the onset of the disease is ushered in with local inflammation, in the area affected. This may be a portion or the whole of a quarter, or even one or more quarters may be involved. Should the affected area be extensive, there will also be constitutional changes, such as rise in temperature and loss of appetite. The local inflammation induces congestion, with the accompanying symptoms of heat, pain, hardness, and cessation of normal milk secretion. The secretion from the congested area is watery, and acid in reaction. This acid fluid, coming in contact with the normal milk in the teat duct, causes it to curdle, and the milk from that quarter will contain clots of curdled milk. Should proper attention be given to the case at this stage, the disease is arrested, and recovery quickly follows. First give a good active purgative, such as 12 to 16 oz. Epsom salts, mixed with a quart of warm water. To this mixture add a cup of treacle and a dessertspoonful of ground ginger, and give as a drench. Local treatment consists of hot foments to the part, and frequent milking. Fomentations to be of value must be long continued—at least two hours once or twice daily—and followed by well rubbing with equal parts of belladonna and soap liniments.

Specific Contagious Mammitis.

If treatment has been omitted at this stage, pus-forming organisms invade the inflamed area, gaining an entrance through the milk ducts. The affected area is now an ideal breeding-place, and they multiply very rapidly. Fluids drawn off at this stage will contain pus (matter) in addition to the curdled milk.

In the blood stream are certain cells called Phagocytes, whose function is to destroy invading bacteria. These Phagocytes collect in and around the affected area. If they are not sufficiently numerous to destroy the bacteria, they cluster in the surrounding tissue to prevent the spread of the invading organisms. But during this time the toxins produced by the bacteria have caused a breaking down of the cellular tissue, which, when mixed with the toxins, has a debilitating action on the organisms, which lowers their vitality. To further neutralise the action of the bacteria, certain substances known as Opsonines or Antibodies appear in the blood stream and collect around the affected area and eventually destroy the invaders. The organisms having been destroyed, the temperature of the part is reduced, but the presence of the pus produced by their activity still remains and acts as a mild irritant. Should it be small in quantity, it is absorbed into the system, but where the accumulation is considerable, an abscess is formed.

Should the seat of the abscess be deeply surrounded by tissue, the fluid portions are absorbed and a fibrous capsule develops around the remainder. Should the abscess be near the surface, an external opening is formed and the contents evacuated, and the broken-down tissue is replaced by non-secreting tissue. Occasionally the abscess breaks into a milk duct, and the pus can be drawn through the opening in the teat.

During what may be termed the secondary stage of the disease—that succeeding bacterial invasion—hot fomentation is of pronounced value, as it assists in reducing temperature by relaxing the tissues, and also induces a freer blood supply to the part. Should pain be severe, apply a mixture of equal parts of belladonna liniment and soap liniment. Should the weight of the organ cause distress, support it by a broad bandage about 2 feet wide, in which four holes have been made for the teats. Place the teats in the holes, and pass the ends over the loins, tying sufficiently tightly to support the weight of the udder.

This serious disease is continually being brought under notice through outbreaks occurring in dairy herds, and its spread may be attributed partly to the carelessness of the dairy farmer and partly to the want of proper hygienic methods of controlling it.

The disease is a catarrhal affection and is limited, in most cases, to the delicate mucous membrane lining the milk ducts of the mammary gland. As a rule there is very little heat or swelling; moreover, the affected parts are not particularly painful.

The disease is caused by a tiny chain-forming micro-organism, or streptococcus, which attacks the mucous membrane and, by the development of its poisonous products or toxins, causes a rapid destruction of tissue cells and leucocytes (or white blood corpuscles) which are attracted to the spot. These dead cells produce that peculiar feature of the disease—a yellowish, purulent discharge, or pus, which can be withdrawn from the affected quarter.

Symptoms.

In the acute form the first symptoms are a diminution in the milk yield (usually in but one quarter of the udder); a definite acidity of the milk, and a tendency for it to become rapidly coagulated. Gradually the milk assumes a dirty, brownish colour and becomes more curdly, the amount of secretion from the affected quarter diminishing owing to the thickening of the milk ducts, which finally become impervious and the whole quarter is rendered useless. The lesions develop slowly, and first one quarter then another of the udder becomes involved, and later the milk secretion is liable to stop entirely. It will be observed in some cases of slight infection that the milk does not appear to be curdled, and the deposit when settled is so very small as to be overlooked.

Methods of Transmission.

Undoubtedly the transmission of the disease from cow to cow is through the agency of the hands of the milker or the cups of the milking machine. This appliance, which was designed to enable the farmer to produce cleaner milk than by any other method, must be kept scrupulously clean, and the cups should be sterilised after each milking by means of washings with boiling water.

Before and after each milking of an affected animal, the hands of the milker and the teats and udder of the cow should be washed with some reliable disinfectant solution, such as Hycol, Kerol, or Cyllin diluted in the proportion of 1 part of disinfectant to 250 parts of water—that is, 1 teaspoonful to 1 quart. Care must be taken not to allow any of the milk or cream from healthy animals or any of the dairying utensils to become tainted with the disinfectant, as the flavour and odour might be detected in the butter. To obviate this the disinfectant, after being allowed to act for ten minutes, should be washed off with sterilised water—that is, water that has just previously been boiled and allowed to cool.

Once the disease has appeared in a herd, the owner should personally examine minutely every cow's udder before milking and note carefully the character of the first small quantity of milk drawn. Any cow that shows signs of the disease, or that is in any way suspicious, should be held over to the last for hand-milking, and on no account should the cups of the milking machine be used on her.

Milk from an affected cow must be considered dangerous. The animal should be milked last into a vessel kept specially for the purpose, and the milk scalded so as to destroy the mammitis germs and buried.

Vaccine Treatment.

Both preventive and curative treatment have been successfully carried out by means of vaccine prepared at the Stock Experiment Station, Yeerongpilly. When used as a preventive the vaccine confers a period of immunity to contagious mammitis which varies very considerably in individual animals, and in no case is it thought that this period exceeds twelve months. The most opportune time to use the vaccine for protective purposes is just before or after calving, when the cow is usually most susceptible.

A "stock" vaccine may prove useful as a curative, but the best results are usually obtained from an autogenous vaccine—that is, one prepared from the particular strain of germ affecting the animals it is proposed to treat. To prepare such a vaccine it would be necessary for the Government Bacteriologist, Stock Experiment Station, Yeerongpilly, to receive a few teaspoonfuls of strippings from the affected quarter of a cow, forwarded with as little delay as possible in a clean bottle with no preservative added. A few days are required to prepare the vaccine, which will remain potent for about six months.

Directions for Use.

The vaccine is injected into the loose subcutaneous tissue behind the shoulder in the same manner as tick fever inoculation is performed, and the ordinary 10 c.c. tick fever inoculating syringe and needle are necessary to carry out the work. These may be obtained from any veterinary supply house.

The full dose of vaccine in ordinary cases is 4 c.c., injected in two doses of 2 c.c. each, with an interval of forty-eight hours between the injections. Two injections of 2 c.c. each will usually effect a cure, but in cases of long standing it might sometimes be found necessary to continue the treatment.

Before the injections are commenced the syringe and needle, with the parts loosened, should be sterilised by boiling in water for ten minutes, and the skin of the animal at the proposed site of injection should be washed with a solution of Hycol, Kerol, or Cyllin—1 teaspoonful to 1 quart—for ten minutes.

CONTAGIOUS MAMMITIS VACCINE—SCALE OF CHARGES.

No. of Animals.	Charge. s.	d.
1	2	6
5	6	3
10	10	0
20	16	8
25	20	0
40	30	0
60	40	0
80	46	8
100	50	0

REMITTANCE MUST ACCOMPANY APPLICATION.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·08	82	67	88	14	57	24, 25	30	2
Herberton	..	75	51	82	14, 24	41	23	36	5
Rockhampton	30·13	81	57	87	10, 13	50	16	24	2
Brisbane	30·14	76	54	86	23	48	3	95	3
Darling Downs.									
Dalby	30·14	75	44	87	11	32	3	92	6
Stanthorpe	..	66	38	78	12	28	16,3	102	4
Toowoomba	..	69	45	78	9, 13	33	3	147	5
Mid-interior.									
Georgetown	30·04	90	61	95	15, 11	53	19	3	1
Longreach	30·07	86	53	97	12	45	24	0	0
Mitchell	30·14	76	43	89	9, 12	33	24	17	2
Western.									
Burketown	30·05	87	62	92	28, 29	55	4	0	0
Boulia	30·07	86	56	101	11	45	24	0	0
Thargomindah	30·12	76	52	95	8	42	27	12	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Sept.	No. of Years' Records.	Total Rainfall. Sept. 1930.	Sept. 1929.
North Coast.	In.		In.	In.
Atherton	0·66	29	0·71	0·19
Cairns	1·70	48	1·21	0·96
Cardwell	1·55	58	0·46	0·51
Cooktown	0·59	54	0·45	0·26
Herberton	0·49	43	0·36	0·28
Ingham	1·52	38	0·80	0·39
Innisfail	3·60	49	1·24	1·81
Mossman	1·49	17	0·48	0·76
Townsville	0·84	59	0	0·17
Central Coast.				
Ayr	1·48	43	0	0·20
Bowen	0·84	59	0	0
Charters Towers ..	0·77	48	0·21	0·10
Mackay	1·62	59	0·07	0·24
Proserpine	2·19	27	1·81	0·18
St. Lawrence.. ..	1·27	59	0	0
South Coast.				
Biggenden	1·54	31	1·45	0
Bundaberg	1·64	47	1·54	0·18
Brisbane	2·00	79	0·95	0·48
Caboolture	1·87	43	0·73	0·36
Childers	1·81	35	1·64	0·11
Crohamhurst ..	2·65	37	0·21	0·35
Esk	2·16	43	1·58	0·45
Gayndah	1·55	59	2·40	0·08
Gympie ..	2·11	60	2·00	0·12
Kilkivan	1·71	51	0·85	0
Maryborough .	1·93	58	0·98	0·36
South Coast—continued:	In.		In.	In.
Nambour	2·57	34	1·26	0·33
Nanango	1·81	48	1·16	0·17
Rockhampton ..	1·33	43	0·24	0·03
Woodford	2·20	43	1·52	0·20
Darling Downs.				
Dalby	1·69	60	0·92	0·08
Emu Vale	1·74	34	1·54	0·28
Jimbour	1·51	42	0·78	0·15
Miles	1·38	45	0·78	0·11
Stanthorpe	2·30	57	1·02	0·60
Toowoomba ..	2·15	58	1·47	0·36
Warwick	1·81	65	1·33	0·34
Maranoa.				
Roma	1·46	56	0·C6	0·01
State Farms, &c.				
Bungeworgorai ..	1·03	16	0·13	0·02
Gatton College ..	1·55	31	1·15	0·20
Gindie	1·04	31	1·01	0
Hermitage	1·49	24	1·28	0·24
Kairi	0·66	16	..	0·45
Mackay Sugar Experiment Station ..	1·53	33	0·18	0·02
Warren	0·83	15	..	0

GEORGE. G BOND, Divisonal Meteorologist.

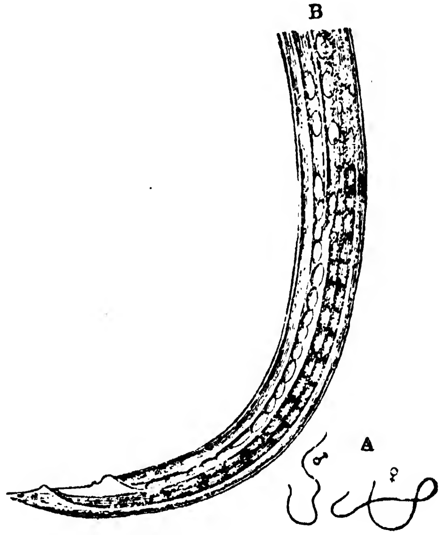
LUNG WORMS IN CALVES.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

This affection is known as verminous bronchitis, hoose, or husk. The worms found in the lungs are the *strongylus micruris* and *Strongylus pulmonaris*. The former are the larger, being about 1 to 3 in. long; whilst the latter is only $\frac{2}{3}$ to $1\frac{1}{3}$ in. in length. This disease has been known since the year 1744, when Ruysch discovered worms living in the air passages of calves. Nicholls also refers to the same disease in 1756, when it assumed an epizootic form in England.

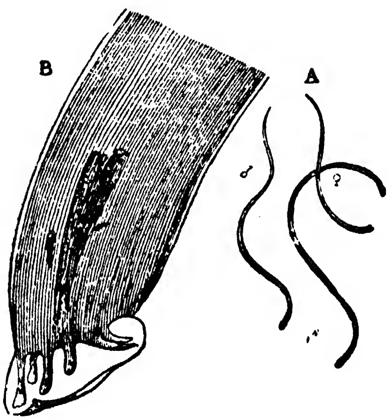
STRONGYLUS RUFESCENS.

Caudal extremity of the male; magnified 100 diameters.—*Railliet.*



STRONGYLUS RUFESCENS.

Found in air passages of sheep and goats.
a—Male and female; natural size.
b—Caudal extremity of the female; magnified 50 diameters.—*Railliet.*



STRONGYLUS MICRURIS.

Found in air passages of calves and older cattle.
a—Male and female; natural size.
b—Caudal extremity of the male; magnified 100 diameters.—*Railliet.*

PLATE 169.

Symptoms.

If the worms are not very numerous, one notices an occasional husky cough; and, if the animals are driven or excited, the breathing may appear short and hurried. The disease gradually spreads from animal to animal until the majority exhibit this peculiar cough or hoose. After a few weeks, the cough becomes more frequent, and appears to be suffocating the animals—in some cases suffocation actually takes place. A frothy liquid sometimes streaked with blood is discharged from the nostrils. This discharge contains eggs, also embryo and mature worms. The movements of the worms are easily recognised, particularly when placed in a little warm water. The calf loses condition and strength; the mucous membranes of the eyes and mouth become very pale in colour; eyes sunken; skin hidebound, dry, and scurfy; the hair staring; and occasional diarrhœa. The animal wanders away from the others, and is found lying down apparently listless and poverty-stricken. The duration of the disease varies according to the number of worms present and the general condition and constitution of the animal. Some cases only last two or three weeks, whilst other survive for several months.

Upon *post-mortem* examination the worms can be found in the air tubes, the lining of which is inflamed; and the lungs frequently have a somewhat mottled or patchy appearance.

Prevention.

Healthy calves should be kept from paddocks where infested animals have been, but horses and sheep can be turned into them with safety. The land, if damp or boggy, should be drained; waterholes are a great source of infection, and should be avoided, if possible; buckets or troughs are better, as these can be frequently cleansed and disinfected. Keep up the strength of the animal by giving good nutritious food, and allow constant access to salt, because salt destroys the young worms as they are taken into the animal's body. Animals dying from this affection should be thoroughly burned or buried deeply.

Treatment.

The quickest and most reliable treatment is to inject a solution directly into the trachea (windpipe). Various solutions have been used; but the following is recommended, and is the dose for a calf:—

Oil of turpentine	1 drachm.
Carbolic acid	10 minims.
Chloroform	½ drachm.
Glycerine	1 drachm.

To be thoroughly mixed together before using each dose; then slowly injected by means of a syringe into the windpipe.

The needle of the syringe is inserted between the rings of the trachea (windpipe) about half-way down the neck. Some people advocate making a small incision in the skin with a clean knife before inserting the needle; but, if the needle is fairly thick and carefully handled when being pushed through the skin, it will be found unnecessary to incise the skin. This injection causes considerable distress to the animal by setting up paroxysms of coughing; but it passes off without setting up serious irritation, and is effective in destroying the worms.

In bad cases it is advisable to repeat the injection on two or three occasions, allowing some three days' interval between the injections; but in many cases one injection will be found sufficient.

If it is impossible to procure a syringe, a drench composed as follows can be given, but its action is not so effective:—

Oil of turpentine	½ oz.
Creosote	½ drachm.
Tincture of camphor	½ oz.
Milk or linseed oil	4 to 6 oz.

This drench should be given once or twice weekly for some three or four weeks.

Sheep, and particularly lambs up to twelve months of age, are similarly affected with worms in the lungs, although not the same worms as found in calves. The treatment described in these notes will be found just as effective, except that the dose of medicine given is considerably smaller—viz., about one-quarter to one-half of the above doses.

The Young Farmer.

TRAINING THE YOUNG FARMER.

DISCUSSING the training of young people for land industries in a recent issue of the "Live Stock Journal" (England), "Salopian," though writing especially for his readers in Britain, expresses some definite opinions on a subject of great interest to Australians, and his views are well worth quoting. This is what he says:—

In spite of the fact that no other industry has so bad a name as agriculture as a money-making business, there appears to be no diminution in the number of young men who are anxious to take up farming as a profession, so that the question of agricultural training is of greater importance than ever, considering the many problems and difficulties that must be faced and overcome if a living is to be made out of the land. Everything is cut so fine nowadays, and the margin of profit, where it exists, is so small that a thoroughly practical and scientific knowledge of everything connected with farming and livestock breeding and management is absolutely essential if that calling is to be made a success.

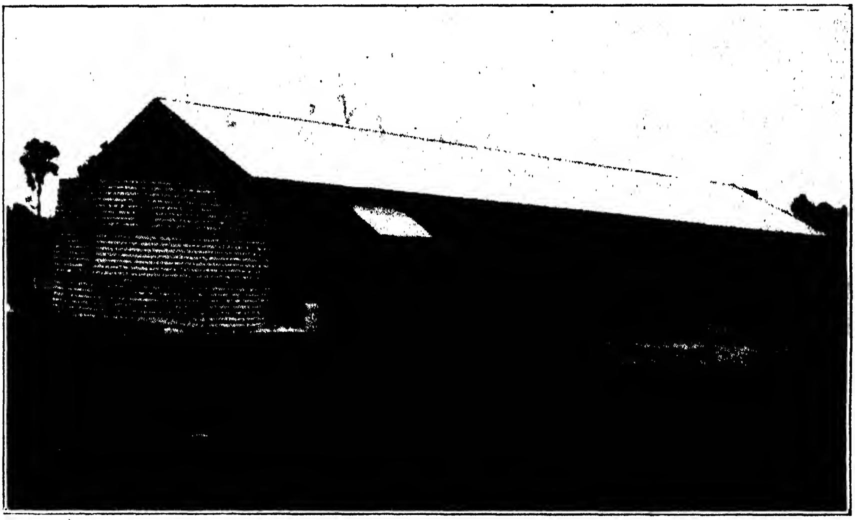


PLATE 170.—MR. A. SYBERG'S MILKING SHED AT MUGGLETON, NEAR ROMA.
This substantial structure was built of timber cut and sawn on the farm, and erected by Mr. Syberg with the help of one man.

Practical Training Essential.

Not only are many young men taking up farming as a profession, but a large number take up an agricultural training with a view to obtaining one of the numerous posts that are now available for the purpose of teaching farmers how to farm, county council lecturers, agricultural organisers, and so forth, so that agricultural training is becoming very much more advanced than it was a generation ago. At the same time it is very important that any boy or youth who intends to take up farming seriously with a view to making a living by it should begin at the right end and obtain a thoroughly practical knowledge of the business before taking up the scientific side. Unfortunately, very many obtain scientific training before going through the practical part, with results that are only to be expected.

To begin with, any boy who is brought up on a farm has an advantage over those who are town bred or have no family connection with farming, as he has had the opportunity of seeing for himself from his earliest childhood all the different phases of animal life and farm work, so that horses and cows, lambs and calves, and their habits and necessities are all quite familiar to him, as well as ploughing and sowing, haymaking and harvesting, and so forth by the time he is old enough to leave home to go to school.

He is often sent on little errands in connection with some matter or other, helps with the animals, perhaps feeds the calves and learns to milk, so that by the time he is ten years old he has a fair idea about farming operations, and if he does not know the why or the wherefore of everything he sees, yet he sees things done; and youthful impressions generally stick. The town-bred boy, on the other hand, sees and knows practically nothing till the time comes for him to leave school, when he is probably sent for a short time on to some farm or other to see how he likes it. This is previous to deciding what course he is to take to learn the art and science of agriculture.

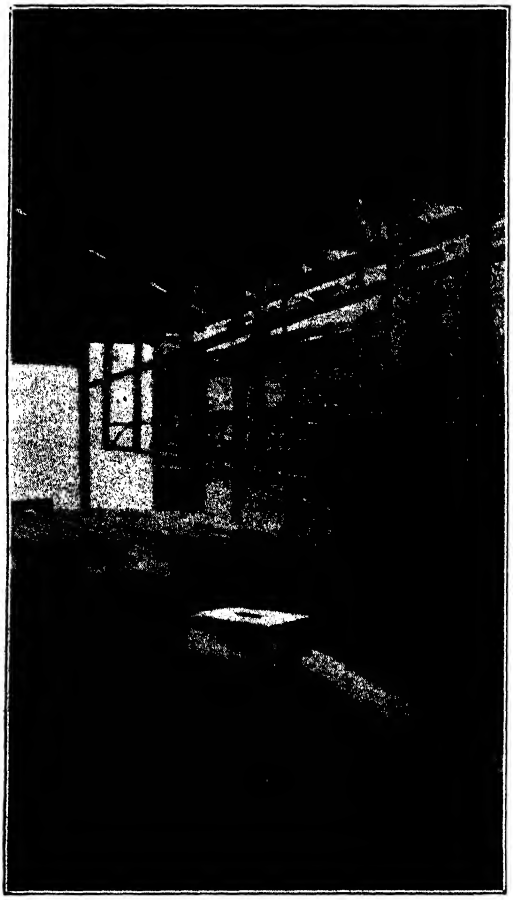


PLATE 171.—MR. A. SYBERG'S MILKING SHED AT MUGGLETON, NEAR ROMA.
Interior, showing bails installed on the echelon principle. The floor is of solid concrete.

Which Course?

The question is: Which is the best course to adopt in each of the above cases to give a boy a thoroughly practical as well as scientific training? It stands to reason that the farm-bred boy and the town-bred boy will need something different in their courses of instruction. The one has everything to learn, the other a great deal, while he has also probably something to unlearn. The only courses of instruction open are a period of pupilage with a thoroughly good and practical farmer and a course at one or other of the agricultural colleges. The great majority of farmers' sons are compelled through force of circumstances to learn what they can at home, supplemented when possible by what they can gather at county council

lectures. Some who are more fortunate are able to have a year or two with some other large farmer, perhaps in another county, where they may have the opportunity of seeing a different and perhaps better and more up-to-date form of management than at home, and then finish up with a year or two at an agricultural college. Those not bred on farms must either go as farm pupils or to a college, or both.

When?

There can be no question as to the value of a course at an agricultural college in these days when science is becoming more and more applied to agriculture, but the question is when is the best time to have the course. To my mind, it is absolutely essential that before a young man enters an agricultural college he should first of all have had a thoroughly practical training on a farm. If he can

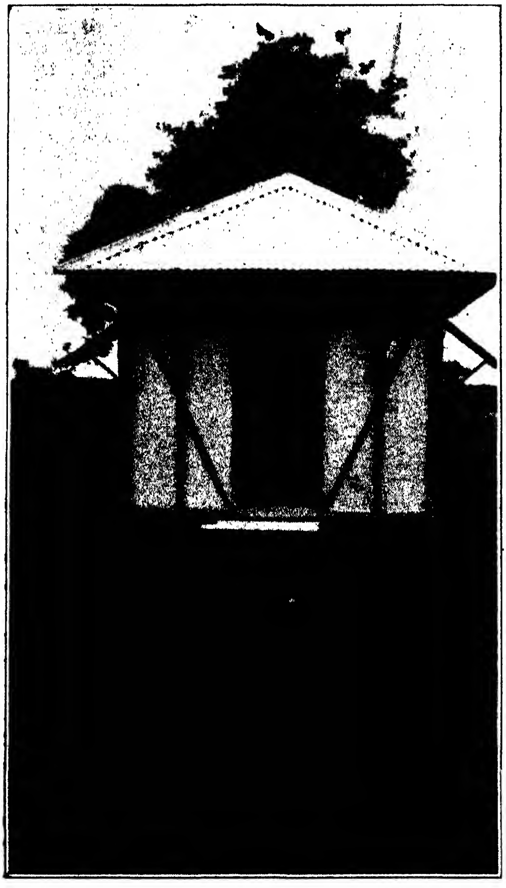


PLATE 172.

This well-built and equipped Dairy is on Mr. Syberg's Farm at Muggleton, near Roma. Every practicable provision has been made for ventilation and coolness.

learn to apply science to practice he will stand a chance of succeeding; but if he cannot apply practice to science, or, in other words, if he is full of scientific knowledge and has no practical knowledge, the end will be disastrous.

At the agricultural colleges such subjects as the influences of the various kinds of fertilisers on different soils, on the necessary constituents to plant life, the proper balancing of food rations, and so forth, receive greater attention than the fundamental practical principles of farming. Anyone who is to make a living by farming must thoroughly understand the working of and the management of stock,

how to buy and sell, the management of men and how much work they ought to get through in a day, and how their work should be done, and be able to show them how to do it if they do not know. All these things should be thoroughly learned on a farm before any course is taken at an agricultural college. Then a year or two there, where a knowledge of agricultural chemistry can be acquired together with some scientific knowledge of dairying and veterinary work, will be found a most useful finish to the practical training received on a farm.

Too Much Science.

In agricultural teaching there is nowadays too much science and not enough practice. All our lecturers are brimful of scientific knowledge, and it is hopeless for any young man, however practical he may be, to attempt to get a post as a lecturer unless he has great scientific qualifications. His practical knowledge appears to be of little account, and yet what is wanted is a man who can lecture on the practical principles of farming in every branch, with sufficient scientific training to know where science can be profitably applied to practice. Many of our lecturers talk above the heads of their audience, and some of them try to impart notions which practical farmers know by experience to be utterly impracticable. Many young men who have acquired most of their knowledge of farming at a college have to buy their practical experience when they take a farm to the tune of several hundreds a year for perhaps four or five years.

A hundred a year paid in premium for a few years with a thoroughly sound, practical, and well-educated farmer, followed by a year or so at a college, will save many hundreds of pounds afterwards. Scientific training has undoubtedly done much good in many ways, and has broken down many old-fashioned ideas and prejudices which have been proved to be wrong; but practical principles must be thoroughly installed first. The motto of the R.A.S.E. is "Practice with Science," and on those lines agricultural training should be given. In farming more than in perhaps any other profession or trade an ounce of practical knowledge is worth a ton of theory.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Emu Apple.

E.G.L. (Maleny)—

The Emu Apple, common in Western Queensland and New South Wales is *Owenia acidula*, the genus Owenia being named in honour of the late Professor Owen of the British Museum. So far as we know neither seeds nor plants are stocked by seedsmen, and your only hope of getting seeds would be to write to a friend in the West in the country where trees are growing. As you remark, it is a beautiful tree, though it seems rather hard to propagate. If you cannot get the Emu Apple, the Tulip Tree (*Harpullia pendula*) is a native tree that does well in your locality, and should be suitable for your purpose. The Queensland Nut (*Macadamia ternifolia*) often also makes a handsome tree, also the Crow's Ash (*Flindersia australis*), though the latter eventually grows rather big for a lawn specimen.

Forget-me-not.

C.S. (Caboolture)—

The specimen is *Cynoglossum australe*, commonly known in Queensland as Forget-me-not, and very closely allied to the true Forget-me-not of Europe. So far as known, neither this plant nor any of its allies possess any harmful properties.

Botanical Specimens from Miles.

INQUIRER (Brisbane)—The specimens collected in the vicinity of Miles have been determined as follows:—

1. *Triodia irritans*. Spinifex.
2. *Amphipogon strictus*. A common grass on poorer soils in the West. I have not heard a common name for it and should consider it of only secondary importance as a fodder.
3. *Andropogon sericeus*. Blue Grass.
4. *Eriochloa annulata*. Dairy Grass.
5. *Tetragonia expansa*. New Zealand Spinnach.
6. *Andropogon refractus*. Barbed-wire Grass.
7. *Chenopodium triangulare*. Fish Weed. A good fodder.
8. *Plantago varia*. Small Plaintain.
9. *Rhagodia linifolia*.
10. *Enchylaena tomentosa*. A Cotton Bush.
11. *Callotus lappulacea*. A "Bindy-eye."
12. *Amphipogon strictus*. Same as No. 2.
13. *Aristida ramosa*. A three-pronged Spear Grass.

Native Frangi-panni.

M.R. (Toowomba)—

Your specimen is *Hymenosporum flavum*, a native tree of the Pittosporaceæ or Pittosporum family. We have heard it called Native Frangi-panni. It is a beautiful tree and well worthy of cultivation for ornamental purposes. It is moderately common in South-Eastern Queensland, particularly along creek banks, but is not confined to such situations.

Finger Cherry or Native Loquat—A Cause of Total and Permanent Blindness.

T.B. (Townsville)—

The specimen is the Finger Cherry or Native Loquat, *Rhodomyrtus macrocarpa*, one of the most dreaded fruits in North Queensland, as it at times contains a poisonous principle which destroys the optic nerve, thereby causing permanent blindness. There is no doubt about the effects of this fruit, as there are quite a number of cases on record of permanent blindness having been caused by it, some of the sufferers now being inmates of the Blind and Deaf and Dumb Institution. It is not known what the poisonous principle is. It has been thought to be a fungus which invades the fruit, but this fungus, or allied forms at least, are found in most over-ripe fruits and are not known to cause harm in any way. The plant contains a saponin, and this has been regarded as the cause of the trouble. Possibly the saponin tends to disappear as the fruits ripen, but of this we have no knowledge. Certain people affirm that they have eaten the fruit both raw and cooked, and no ill effects have followed. However, the danger exists, and it is well not to partake of the fruit at all. The matter is one worthy of investigation, but so far has never been systematically investigated by chemists or medical men.

Stagger Weed or Wild Mint.

D.W.McL. (Rosewood)—

The specimen is *Stachys arvensis*, the Stagger Weed or Wild Mint. Resting stock are usually unaffected by this plant. In feeding experiments with sheep, lambs were seen to be more susceptible than adult sheep. Symptoms are not manifested as a general rule until the sheep ar driven, the distance travelled before the symptoms become apparent varies from a few hundred yards to one or two miles. Cattle so far as we know as unaffected.

Lamb's Tongue.

D.H. (Boggabilla)—

The specimen is *Plantago varia*, a species of Plaintain or Rib Grass. The common Lamb's Tongue of Europe belongs to the same genus and the properties of the Queensland plant, which is very closely allied, are probably the same. The affinities are so close that there is no reason why the present plant should not receive the name Australian Lamb's Tongue.

Hexham Scent. Burr Trefoil.

J.A.F. (Kingaroy)—

The larger plant is the Melilot or Hexham Scent (*Melilotus parviflora*), a fairly common weed in Queensland, particularly on the Darling Downs during the winter and spring months. Some years ago it was boomed as a fodder under the name of King Island Melilot, and has a certain value for land that is not suitable for lucerne or better class fodders. It is apt to taint milk rather badly.

The smaller plant is the Burr Trefoil (*Medicago denticulata*), a very common weed in Queensland during the winter and spring months. It makes quite good fodder for cattle, though in its more succulent stages is apt to bloat them badly if they feed largely on it. As the plant dies off it leaves a mass of burr-like pods, but these are eaten by stock, particularly sheep, and have a definite food value. The plant should make good hay, but we think the specimens you sent are, perhaps, now rather far advanced for that purpose.

Barley Grass.

C.P.C. (Oakey)—

The grass is *Hordeum leporenium*, Barley Grass, a native of the Mediterranean region, now a common naturalised weed in Australia. The grass in its very early stages provides a certain amount of winter fodder, but very quickly loses its palatability and food value as it comes into seed. The seeds are very objectionable as they get into the jaws, eyes, and nostrils of live stock, often causing irritation and sores. It is not worth propagating as a fodder grass in your locality.

"Kangaroo Apple."

H.A. (Tallebudgera)—

Your specimen is the Kangaroo Apple, *Solanum aviculare,* the berries of which are poisonous. The symptoms of poisoning by Solanum berries are usually stupefaction, staggering, loss of feeling and consciousness, cramps, and sometimes convulsions. The pupil of the eye is generally dilated.

New Zealand Spinach. French Catch Fly.

R.O. (Waterford).—The specimens are as follows:—

(*a*) *Tetragonia expansa,* New Zealand Spinach. A common weed in cultivation in Queensland, also found round cowyards, and in fact anywhere where the ground has been disturbed. The leaves are sometimes used as a substitute for ordinary spinach.

(*b*) *Silene gallica,* the French Catch Fly. A European weed now naturalised in most warm countries. It is very common in Queensland, but is not particularly aggressive.

The Prickly Poppy.

J.S. (Kingsthorpe)—

Your specimen is *Argemone mexicana,* the Prickly Poppy, a native of the warmer parts of America, but now naturalised as a weed in most warm countries. It is a very aggressive plant once it gets on to a property and is poisonous, though stock rarely touch it. The only cases that have actually come under our notice of stock eating it is where the plants have been cut down and allowed to wilt. It is gazetted a noxious weed throughout the whole State. It is a thistle-like plant and is sometimes known under the common names of Prickly Thistle, Californian Thistle, &c.

Plant Poisonous to Stock.

W.W.McL. (Murgon)—

No leaves were included in the specimen and those of vine, called by you Wild Grape Vine, are necessary for correct determination. However, the stem looked to us like that of *Vitis acetosa,* which contains a poisonous principle (calcium oxalate) which occurs in the form of crystals in the plant tissues and causes intense irritation of the soft parts of the mouth when the plant is chewed. If, however, poisoning was by this plant, the calves would slobber very much at the mouth with a great flow of saliva, and the mouth would also be somewhat swollen and very painful. We think you must look elsewhere for the trouble. We suggest your sending small pieces of any plant under suspicion down for determination and report. Pieces a few inches should suffice and preferably with either flowers or fruit, but leaves certainly are essential.

Plant Specimens from the Barrier Reef.

T.A.P. (Toowoomba)—The specimens from the Barrier Reef have now been determined as follows:—

1. *Achyranthes aspera,* sometimes called Needle Burr, though this name is applied also to other plants in Queensland.
2. *Stenotaphrum subulatum.* A grass allied to the common Buffalo Grass.
3. *Cordia subcordata.*
4. *Celtis paniculata* as far as can be told from the specimen which bears leaves only.
5. *Abutilon indicum.*
6. *Scaevola Koenigii.* This plant is widely spread over the Malayan region and the Pacific. The pith is sometimes used for the making of artificial flowers.
7. *Tournefortia argentea.*

Tanning Marsupial and Other Skins.

We have received numerous letters asking for instruction in curing and tanning these and other skins. Perhaps the following methods will prove satisfactory:—

The general principle is to trim off the useless parts of the skins and remove all fat from the inside. Then soak the skins in warm water for about an hour. Then apply a coating of borax, saltpetre, and Glauber's salts—1 oz. of each, dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This latter mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. of alum, 3 oz. of salt, and 2 oz. of saluratus; dissolve these in hot water, and, when cool, soak the skin in it for twelve hours. Wring out, and hang up to dry. If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

Another method is, first to remove the flesh and fat. Then wash the skin in a solution of sal. soda and water. Take 4 oz. of powdered alum, 8 oz. of salt, 1 quart of new milk to 4 gallons of salt water, and 1 pint of prepared starch. Stir well, and then put in your fur skins. Air them often by hanging them over a stick laid across your tan tub. Handle this occasionally until they have been in the liquor for a day or two. Then remove the skins and add to your liquor a half teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour. Then take them out and wring and rinse off in soft lukewarm water, and hang them up in a cool place, and when they begin to get white work and stretch them till they are dry.

Hides of larger animals, such as kangaroos, calves, &c., should remain longer in the solution.

To cure a tough skin, trim it on the flesh side with a sharp knife and then well brush with a solution of 2½ lb. of alum and 1 lb. of common salt in 1 gallon of warm water. The skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board to dry it.

Note that each kind of skin requires some special treatment—that is, all skins cannot be tanned in the same manner—but the general principle is the same as above.

Still another method is by what is known as "the lighting tanning process," which is said to be the quickest method of tanning wallaby, rabbit, and other skins and is very simple. It is as follows:—Pour five or six quarts of boiling water over two quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to bloodwarm water as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add an ounce of sulphuric acid (H_2SO4). Immerse the skins in the liquor, stirring them occasionally until tanned, which will be in about twenty minutes. When tanned, rinse in clean water and hang out in a shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft and white.

AN INFORMATIVE JOURNAL.

Another Brooklands farmer, in renewing his registration, writes (15*th October*, 1930):—" . . . *There is too much information in the Journal for me to go without it.*"

General Notes.

Skinless Barley Exempted from Operations of Barley Board.

When the Barley Board was constituted it was understood by the growers that the Board would not apply to skinless barley, but only to malting barley. However, the Board was so constituted as to apply to all barley produced in Queensland; but under the Acts the Board is given power to exempt from its operations such sales and purchases or receipts of the commodity as may be prescribed or approved by the Minister. Upon the request of the Board, the Minister for Agriculture and Stock has now approved that all sales of skinless barley shall be exempted from the operations of the Board, and accordingly the Board's operations will in future apply only to malting barley.

South Burnett Tick Cleansing Area.

A deputation of stockowners of the Murgon and Wondai districts, introduced by Messrs. J. B. Edwards and E. H. C. Clayton, M.L.A.'s, waited upon the Minister for Agriculture and Stock (Hon. H. F. Walker, M.L.A.) recently, with reference to the tick cleansing operations in the South Burnett. The members of the deputation pointed out the hardships and inconveniences to stockowners involved, and advocated that the operations be confined to the area originally worked when the cleansing area was first proclaimed. In reply, Mr. Walker stated that he recognised the importance of the matter, and that he had already promised Mr. Edwards, M.L.A., that he would personally visit the area concerned with a view to obtaining first-hand information regarding the position. Mr. Walker also stated that he was in receipt of a counter petition, and at the first opportunity would visit the district in company with representatives of the stockowners concerned, also Departmental officers, and go thoroughly into the question.

Staff Changes and Appointments.

Mr. H. J. Walker, Inspector of Slaughter-houses, Bundaberg, has been also appointed an Inspector of Stock and Brands.

Mr. E. J. Lorraine, Inspector under the Diseases in Plants Act, has been also appointed an Inspector of Stock.

Mr. C. A. Williams, of Goondiwindi, has been appointed an Honorary Inspector under the Diseases in Plants Act.

Mr. S. H. Harding, of Ipswich, has been appointed a member of the Southern District Stallion Board, vice Mr. Ernest Baynes, deceased.

All full-time Inspectors of Stock, Slaughter-houses, Dairies, and Plants, in the employment of this Department have been appointed also Rangers under and for the purposes of the Animals and Birds Acts.

Sanctuary for Animals and Birds at Emu Park.

From 1893 until the present time the only Sanctuary for Animals and Birds at Emu Park has been the Reserve for Water (R. No. 309), on the south-western side of the Emu Park Branch Railway line. This sanctuary has now been extended to include the adjoining Recreation Reserve, R. 311, and, on the opposite side of the railway line, the Reserve for Water, R. 318, and the Reserve for Botanical Gardens, R. 325. Included in this extension of the Sanctuary are also parts of Marine parade, and of Nicholson, Pattison, Pears, and William streets, and also a short length of the reserve for the Emu Park Branch Railway.

Scour in Pigs.

Mr. C. G. Dale, of Lagoon Pocket, Mary Valley Line, Queensland, recently had a young pig seriously affected with blood scour of a type similar to that from which calves occasionally suffer. As the animal was in extreme pain and appeared to be rapidly failing, urgent treatment was necessary, and as there were no other remedies to hand, Mr. Dale administered a dose of two tablespoonful of brandy mixed with white of egg. This stimulating drench had its effect and, in due course, the animal began to pick up again, and in a day or two was on its feet again well on the way to recovery. Such remedies are often effective and are always well worth trial.

Share Dairymen.

We have a number of applications from experienced dairymen, with satisfactory records and the requisite family labour, seeking the working of a dairy herd on shares. Though no responsibility is undertaken, we would be glad to know of any dairy farmer who is contemplating letting his herd on shares, with a view to placing him in communication with the applicants referred to.

Extension of Northern Pig Board for Five Years.

The Northern Pig Board, which was first constituted in 1923, was reconstituted in 1926 for a period of five years as from the 1st January, 1926, and was made to apply to all pigs grown in the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan during that period. As the Board will expire on the 31st December, 1930, an Order in Council has been issued giving notice of the intention of His Excellency the Governor in Council to extend the Board for a period of five years—that is to say, until the 31st December, 1935. The Order in Council also provides that growers may lodge a petition for a poll to be taken on the question of whether the Board should be so extended or not. Such petition must be signed by not less than 10 per cent. of the pig-growers to which the Board applies—that is, persons who, at any time during the last six months, produced pigs for sale in the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan. The petition, if any, must reach the Minister on or before the 10th November, 1930.

Nominations for Growers' Representatives.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, until 5 p.m. on the 10th November, 1930, for election for one year as Growers' Representatives on the Northern Pig Board.

Five such representatives are to be elected by those persons who, at any time since the 16th June, 1930, kept pigs in any of the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan.

Each nomination is to be signed by at least then such growers.

If more than five nominations are received, a postal ballot will be taken, and the election, if any, will be held on the 17th December, 1930.

To ensure their names being on the roll, persons eligible to vote at this election are invited to send their names and addresses at once to Mr. A. H. Jones, Returning Officer, Department of Agriculture and Stock, Brisbane.

The Roadside Market for Fruit and Vegetables.

In recent years, largely as the result of the growth of motor traffic, a new and often profitable outlet for their products has presented itself to fruit and vegetable growers in the form of the roadside market. In some cases it is the practice of the grower merely to set up a sign directing the attention of the traveller to the fact that produce is procurable from his property, while others find it advantageous to set up a stall on the roadside adjacent to it. Others yet again, situated less favourably in regard to traffic, erect a stall on the roadside in some more suitable place.

In the establishment of this type of market certain points must be observed. The stall should be situated on that side of the road on which the bulk of the traffic passes on the homeward journey. The convenience of the potential buyer should be studied. The stall should not, for instance, be located on a steep hillside; a better point would be on the hilltop. Warning notices could with advantage be set up on the hill, however, the slow speed necessitated by the climb giving the traveller ample time to read them. What might be called psychology of such advertising is rather doubtful. A smart, attractive sign, it might be argued, is the surest sales-getter, but it would appear from the experience of an American grower that the laws operating are somewhat subtle. An up-to-date sign, he found, was much less effective than one of a less pretentious sort, travellers presumably fearing that such advertising betokened a shrewdness which made the chances of bargains proportionately remote. It is advisable to have the prices of the commodities on roadside stalls plainly displayed.

Weighing Butter for Moisture Tests.

In making a test for moisture in butter, the weighing of t e samples in the orthodox manner by means of a chemist's scales takes too much time for the factory operative who is not skilled in handling the weights, or is not quick at figures. The use of the scales and method of calculation of test results may be simplified in this way:—

Exactly balance the evaporating cup on one scale pan by means of a weight on the other. This weight may be made from sheet lead or other metal. If the piece of metal is cut to as nearly as possible the same weight as the cup, any further necessary adjustment may be made by means of the screw-nuts on the ends of the scale beam.

In making the test, first see that the empty cup and the weight exactly balance, then place a ten gram weight on the scale pan with the aforesaid weight. Now place sufficient of the prepared butter sample in the cup to again balance the scales. The sample in the cup will then weigh exactly ten grams. Evaporate the moisture in the usual way. Cool the cup and sample. Then again, balance the scales by placing the necessary weights on the scale pan with the cup and sample.

The percentage of moisture may then be read direct from the total of the latter weights by shifting the decimal point one place to the right, thus, if the weights required to re-balance the scales after the moisture in the sample has been evaporated total 1.56 grams, then the percentage of moisture is 15.6.—F. J. WATSON, Dairy Instructor.

Cost of Loss of Milk Fat in Separating Milk.

Every dairyman knows that loss of milk-fat in separating means to him a loss of money, but many do not realise the extent of the loss even when the result of the Babcock test of the separated milk is known.

In separating, a small amount of fat, which is not recoverable by mechanical separation, is always lost; but should the amount exceed 0.05 per cent., either the mechanism or the manipulation of the separator is at fault.

The following table will give some idea of what extent the loss will be when the actual waste of fat exceeds the amount not recoverable by mechanical means.

Presuming the average yield is the modest amount of one pound of commercial butter to twenty-five pounds of milk, the loss will be as follows:—

Loss of	0.01	per cent. is equal to	loss of 1 lb. in	400	lb. com. butter
„	0.02	„	„	200	„
„	0.03	„	„	133	„
„	0.04	„	„	100	„
„	0.05	„	„	80	„
„	0.06	„	„	66	„
„	0.07	„	„	57	„
„	0.08	„	„	50	„
„	0.09	„	„	44	„
„	0.1	„	„	40	„
„	0.2	„	„	20	„
„	0.3	„	„	13.3	„
„	0.4	„	„	10	„
„	0.5	„	„	8	„
„	0.6	„	„	6.6	„
„	0.7	„	„	5.7	„
„	0.8	„	„	5	„
„	0.9	„	„	4.4	„
„	1.0	„	„	4	„

On the same basis of yield of butter from milk, a herd of cows producing 50 gallons of milk per diem will produce in one year 187,062 lb. of milk yielding 7,482 lb. of commercial butter, which at 1s. 3d. per lb. is worth £467 12s. 6d.

A loss of 0.01 per cent. of fat in separating would mean a loss for the year of £1 3s. 4½d.; a loss of 0.1 per cent. would cause a loss of £11 13s. 9d.; and a loss of 1 per cent. would be equivalent to £116 17s. 6d.

By this it will be seen how necessary it is that the separator should me maintained in perfect order and be operated continually at full speed when separating.—F. J. WATSON, Dairy Instructor.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

SAVE THE BABIES.

A Season of Danger for the Infant.

The hot season is coming. Probably more babies will die during the next three months than during any other three months of the year. It is (though it should not be) the dangerous season for babies. They will die of an infectious and preventable disease. Save the babies!

Last year 112 babies under one year died in Queensland of this disease; the year before 214 died—nearly twice as many. Have our Baby Clinics doubled the efficiency of their work in the past year? Are our Queensland mothers twice as wise? We wish it were so. A part of the decrease may be due to better mothercraft. Most of it was due to good luck. Possibly this year we may have bad luck. The summer before last Rockhampton suffered from a summer epidemic which killed fifty-one babies under two years of age in three months. This season some other town may be threatened by a similar epidemic. Shall we trust our infants' lives to luck, to chance, to fortune? Save the babies!

Summer diarrhœa, dysentery, gastro-enteritis, by whatever name you like to call it, is an infectious disease. It is caused by dysentery bacilli, which are carried about by flies. It is not caused directly by hot weather. Nor has the Jacaranda, which happens to flower at this time of year, anything to do with it. The infection is never present in freshly boiled or scalded milk, for boiling kills dysentery bacilli. If the milk was stale and dirty before boiling, it will give babies simple diarrhœa; it cannot give them dysentery. The milk may be infected after boiling, so may any kind of artificial food, so may the baby's bottles, teats, and dummies. Those who sell dried milks or patent foods may suggest that in them lies perfect safety. It is not true. Foolish beliefs put into mothers' heads are paid for in infants' lives. Save the babies!

Natural Food for the Young Australian.

Save your babies by giving them their natural food—the only food which is perfectly clean, fresh, and safe. Never wean a baby during the next three months if you can possibly help it. If you must wean it, or if it has been weaned already, exercise the utmost care. Scald the milk, scald the bottles, scald the teats, then keep them most carefully covered from flies. Every single fly may carry death for your babe, or, failing death, an anxious, painful, and enfeebling disease. The strongest and finest baby may die of it. Nothing can make the dummy safe. It is a perpetual attraction to flies. Burn it. You may think that the dummy keeps your baby from crying and makes him happier. You are mistaken; but even if you are right, it is better that some babies should cry a little than that one healthy baby should die of dysentery. Be warned in time. Save the babies!

The Responsibility of Local Authorities.

And you Municipal and Shire Councillors, you are partly responsible. The flies get most of their dysentery bacilli from your closet pans. No doubt you have excellent Regulations to prevent flies from getting access to these pans. Do you enforce those Regulations? Have you sufficient and efficient Inspectors? Do you prosecute? Unless you prosecute a few careless people, your Regulations are useless. Save the Babies!

Keep Cool.

We do not say that every mother who does her best will never lose her baby. That would not be fair nor true. There is no perfect safety for anyone in this world. But we do say that such cases will be very rare. There is no need, nor excuse, for foolish panic. Keep cool. Be very careful. Try not to make a single mistake. If you are in any difficulty, consult the Nurse at the Baby Clinic. She is always willing and anxious to help. If you live too far off, ask for a copy of the Queensland Mother's Book. It will be sent on application. Read it carefully. The lives of our Queensland babies are in the hands of our Queensland mothers. Resolve that this summer you will do your very best, God helping you. SAVE THE BABIES!

THE COMPOST HEAP.

The compost heap is a valuable adjunct to the farm, and especially on small areas, where some intensive form of agriculture, such as vegetable growing, is being carried out. A heap or pit can be made very economically. It utilises all sorts of vegetable and animal refuse which would otherwise be wasted, and converts it into a valuable manure, rich in vegetable matter and eminently suited for soils low in humus or subject to droughty conditions.

The principle of the compost heap is the fermentation of easily decomposed vegetable matter in the presence of earth and lime. Not only are substances like peat and straw, which form the usual basis of compost heaps, thus decomposable, but almost every kind of organic substance, both of vegetable and animal origin, can be composted. Dead leaves, bush scrapings, sawdust, weeds, tops and stalks of vegetables, as well as bone and animal refuse, can be treated in this manner. In the case of animal refuse the operation is much slower, and substances like bone should be first crushed. It is also important to be sure that animal refuse so treated is not derived from a diseased source.

The best way of making and maintaining the compost heap will depend largely upon local surroundings. As a general method of procedure the following will be found satisfactory. Make a heap with alternate layers of earth, refuse, and lime. Under the term "refuse" is included all the refuse material of animal or vegetable origin mentioned above. Cover the whole with a layer of earth. When a sufficient quantity of refuse is again collected, place it on top of the heap and cover with a layer of lime, and lastly of earth, until the heap is 3 to 4 feet high. The heap should be kept moist, and for this purpose all refuse water from the house, slops, &c., should be added. The heap may be conveniently watered by making a hole in the interior and pouring the liquid in. The final covering with earth has the object of absorbing any ammonia which is evolved in the process of fermentation and by the action of the lime.

When the heap has been prepared it must be left to itself to ferment for a greater or less time. Probably a few months will be sufficient, unless very refractory substances, such as bone, &c., are present. In a few months' time it should be well forked over and another layer of lime and finally of earth should be added. In the course of another month or two it should be ready for use, and will provide at a very slight cost an excellent manure rich in humus, and will have utilised for the purpose a great amount of refuse material which would otherwise have been lost or burnt.

When refuse material is burnt, the ashes, though still possessing manurial value on account of the line, potash, and phosphates they contain, are of incomparably less value than the original substances out of which they are derived, owing to the absence of humus material and of nitrogen, which have been lost in the process of burning.

Instead of a heap, the compost may be conveniently prepared in a pit. In either case the bottom should be cemented, or so drained that the liquid escaping from the mass can be collected and returned to the compost.

It will be found advantageous to prepare a second heap while the first one is ripening and being used. It will also be found that if it is desired to use more concentrated fertilisers, such as superphosphate, potash, and ammonium salts, these can be mixed with advantage with the compost manure before it is applied to the land. Used in this way they will be in less danger of leaching away, and will be of greater benefit than if applied directly to the land.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producting the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good,

bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codling moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work,

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1930.		December, 1930.		MOONRISE. Nov. 1930.	MOONRISE. Dec. 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.5	6.7	4.52	6.30	1.31	1.55
2	5.4	6.7	4.52	6.30	2.25	2.53
3	5.4	6.8	4.52	6.31	3.17	3.51
4	5.3	6.8	4.53	6.32	4.11	4.52
5	5.2	6.9	4.53	6.33	5.16	5.57
6	5.2	6.10	4.53	6.34	6.16	7.0
7	5.1	6.10	4.53	6.34	7.8	8.5
8	5.1	6.11	4.53	6.35	8.11	9·6
9	5.0	6.12	4.53	6.35	9.13	10.1
10	4.59	6.13	4.54	6.36	10.15	10.47
11	4.59	6.14	4.54	6.37	11.13	11.26
12	4.58	6.15	4.54	6.38	...	...
					a.m.	a.m.
13	4.58	6.16	4.54	6.38	12.5	12.1
14	4.57	6.16	4.54	6.39	12.49	12.35
15	4.57	6.17	4.54	6.39	1.25	1.8
16	4.56	6.18	4.55	6.40	2.0	1.40
17	4 56	6.19	4.55	6.40	2.32	2.16
18	4.56	6.20	4.56	6.41	3.6	2.55
19	4 55	6.21	4.56	6.41	3.40	3.40
20	4.55	6.22	4.57	6.42	4.18	4.32
21	4.55	6.23	4.57	6.43	5.0	5.27
22	4.54	6.23	4.58	6.43	5.48	6.23
23	4.54	6.24	4 58	6.44	6.43	7.20
24	4.53	6.25	4.59	6.44	7.40	8.15
25	4.53	6.25	4.59	6.45	8.35	9.12
26	4.53	6.26	5.0	6.45	9.31	10.4
27	4.53	6.27	5.0	6.46	10.27	10.57
28	4.52	6.27	5.1	6.46	11.22	11.49
29	4.52	6.28	5.1	6.46	12.15	12.41
30	4 52	6.29	5.2	6.47	1.7	1.36
31	...	...	5.3	6.47	...	2.34

Phases of the Moon, Occultations, &c.

4 Nov.	○	Full Moon	8 28 p.m.
13 ,,	☽	Last Quarter	10 27 p.m.
20 ,,	●	New Moon	8 21 p.m.
28 ,,	☾	First Quarter	4 18 p.m.

Perigee, 15th November, at 4.30 p.m.
Apogee, 28th November, at 8.54 a.m.

Mars will, technically, be in conjunction with the Moon on the 13th at 3 a.m., when nearly due north-east; in reality it will appear to be 3 degrees (six diameters of the Moon), to the south of it.

As the Sun will seem to be passing through the constellation Libra in November, reaching Alpha on the 4th, this constellation will be above the horizon all day and not noticeable except in the case of a few of its stars in the west after sunset early in the month. During the last week in November some of the stars in the northern part of Scorpio will be nearest to the Sun.

The grouping of the Moon, Venus and Mercury, nearly in a line with the Sun on the 20th, will be invisible, but should be noted.

Venus will set at 8.29 p.m. on the 1st, and at 7.16 p.m. on the 15th.

Mars will rise at 12.29 a.m. on the 1st, and at 11.57 p.m. on the 15th.

Jupiter will rise at 11.30 p.m. on the 1st and at 10.36 p.m. on the 15th.

Saturn will set at 10.33 p.m. on the 1st and at 9.44 p.m. on the 15th.

About 46 degrees southward of the Sun the Southern Cross will be up all day and getting so near the southern horizon at 8 p.m. as to be invisible.

6 Dec.	○	Full Moon	10 40 a.m.
13 ,,	☽	Last Quarter	6 7 a.m.
20 ,,	●	New Moon	11 24 a.m.
28 ,,	☾	First Quarter	1 59 p.m.

Perigee, 10th December, at 11.42 a.m.
Apogee, 26th December, at 5.48 a.m.

The occultation of the fine star Beta Tauri about one hour after midnight on the 6th instant will be noticeable at all places south of Townsville, north of which the star will be seen below the northern edge of the Moon. This should form an interesting occurrence for all observers with telescopes, field-glasses, or even small binoculars.

When Jupiter and the Moon rise together on the 8th, soon after 9 p.m., the planet will be only 5 degrees distant from the Moon on its southern side. The Moon, being full only two days before, will be too bright for observers to see the stars of Gemini in its immediate neighbourhood.

Jupiter will be apparently very near the place now occupied by the ninth planet Pluto.

The apparently near approach of the quickly moving planet Mercury to slow and stately Saturn will culminate on the 15th, when Mercury will be only 2½ degrees from the bigger planet on its northern side. They will be well situated for observation after sunset, the planets being about 22 degrees above the horizon at that time.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

ANOTHER instalment of his interesting review of the development of sugar-growing in Queensland is supplied by Mr. Easterby. Brown Spot of the passion fruit vine is the subject of a very useful and well illustrated paper by Mr. Simmonds. Field trials of citrus fruits in Southern and Central Queensland are described by Mr. Prest. Mr. Roberts has a brief note on the poultry mite infesting dwellings. Milk and cream testing are discussed by officers of the Dairy Branch for the benefit of the young farmer. Mr. Carew continues his notes on farmers' sheep and wool. Renewed interest in the possibilities of increasing Australian trade with Eastern Asia is stimulated by Colonel Evans's observations in the course of a recent visit to Manchuria, which are continued in the current number. Other features, including general working notes, make up a good December Journal.

Diseases in Stock.

OPPORTUNITY was taken in the measure now before the State House to include many amendments to the Diseases in Stock Act, which were not considered necessary previously. Power will now be given to restrict the movements of suspected stock, to prescribe the routes by which they may travel, to prohibit clean stock from travelling over a suspected route, to declare roads to be stock routes, and to declare any part of the State an infected area. Quarantine areas may also be declared, and provision is made for the destruction of infected stock, with due arrangements for compensation, under prescribed conditions. The Minister for Agriculture and Stock (Mr. Harry F. Walker), who introduced the measure, said, in moving its second reading, that the Government is negotiating with the Commonwealth Council for Scientific and Industrial Research with a view to treating many diseases in stock from an Australian point of view—that is, to eliminate overlapping in many experiments that are being carried out to-day. Queensland is singularly free from most

of the major stock diseases, and is one of the healthiest stock countries in the world. The Government realises the great importance of keeping it so, and every precaution is taken against the introduction of pests and diseases. In keeping our stock free from disease, it is generally admitted that we have done remarkably well, and the progress made in these matters over the last thirty years has been very sound. There is, of course, always room for improvement, and the present measure is in keeping with our general advance in veterinary science.

Yeerongpilly Stock Experiment Station.

DESCRIBING the work of the Yeerongpilly Stock Experiment Station, Mr. Walker, in the course of his speech in Parliament, gave the following summary of its operations for the twelve months ended 30th October last:—

The work included the immunisation of 221 stud animals against tick fever, with only two mortalities.

Twenty-four specially prepared "bleeders" were sold to stockowners, each of which, before sale, was subjected to the tuberculin test and immunised against blackleg.

Three thousand eight hundred and ninety-three doses of recovered tick fever blood were supplied for the inoculation of station and other cattle.

Approximately 1,000 specimens were submitted for bacteriological examination. These included milk, pathological blood, water, cream, pleuro virus, cheese, and butter.

One hundred and ninety-two pleuro cultures of lactic acid bacteria were supplied to cheese factories.

Contagious mammitis vaccine was prepared and distributed sufficiently for the treatment of 9,489 cows.

Three thousand and eighty-five doses of blackleg vaccine were sold and 418 tubes of glucose agar.

Eighty-seven thousand six hundred and sixty-eight doses of natural pleuro virus and 31,275 sterilised setons were supplied to stockowners.

In addition, many bacteriological examinations were made in connection with poultry diseases.

Investigational work included:—

Testing the effects of feeding healthy pigs with milk from a cow known to be affected with tubercular mammitis.

Testing the resistance of tubercle bacilli during the curing process (salting and smoking) of bacon.

Testing the practicability of vaccine treatments for affections of the udder caused by staphylococci and gas-producing bacteria.

Investigations as to the nature and cause of what is popularly spoken of as soft bacon.

Special attention was directed to the preparation of a standardised blackleg vaccine put up in pill form.

The bacteriological examination of samples of water to determine their suitability or otherwise for butter-washing and general factory purposes.

Banana Marketing.

THE Minister for Agriculture and Stock (Mr. H. F. Walker) informed the Press recently that in passing through Sydney to the Wheat Conference at Canberra he had taken the opportunity to make some inquiry as to the condition in which bananas from Queensland were arriving on the Southern market, particularly in respect of the quality of the fruit and the manner in which it was being packed and graded and grade-marked by the growers. The design of the rooms for maturing bananas and the facilities provided and methods adopted for the controlling of the temperatures in these rooms were also made a subject of inquiry by the Minister.

In respect of the quality of the fruit supplied to the market by Queensland, it was found that a large proportion of the fruit was well up to standard, and that some growers were consigning fruit of especially high merit. On the other hand, there was a percentage of growers marketing fruit below standard, which was reacting to the detriment of the industry. Far too many growers were grade-marking their fruit from one to two grade classifications higher than was warranted. This practice had recently been officially brought under his notice, and he intended to take suitable action in the matter, but before doing so he had decided to make inspection and inquiry personally. This he had now done, and had found that there is justification for the complaint. In the interests of the industry, it is essential that the grade mark applied to the package containing bananas shall indicate accurately the grade of fruit packed in each case. Growers defaulting in this direction will be called upon to amend their methods.

The confidence of buyers must be retained if it is desired to hold the Southern market. Queensland growers must more fully recognise this fact, and, in addition, appreciate that New South Wales is at present growing bananas on a scale equal to that of the period precedent to Bunchy Top infestation, and the estimate is that there will be a further 2,000 acres planted under bananas in New South Wales within the next twelve months. That State has banana grade regulations in operation, and Queensland growers should remember this and recognise that the same degree of leniency that has existed in the past will not be continued now that the local production has been increased. The authorities are exhibiting restiveness in the matter of incorrect grade-marking of the fruit grown locally, and it is anticipated that certain definite action will be taken in the matter in the near future, and it would be somewhat remarkable if the defaulting growers in Queensland should escape attention at their hands. He appealed to the growers here to put their house in order without delay.

It was pleasing to note the material improvement that had been effected in the ripening chambers utilised by the more progressive merchants. The improved facilities provided for the maturing bananas will be of great benefit to the industry. He felt confident that there will be an extension in the installation of modern machinery and equipment in the maturing chambers.

Queensland Flora.

THE Bill for the preservation of native flora, introduced by the Minister for Agriculture and Stock (Mr. Harry F. Walker) and which is now before Parliament, has been received with general acclaim. Every thoughtful citizen is heart and soul with the Minister in his determination to provide every possible safeguard for what was described by Professor Goddard of the Queensland University, in a recent public address, as our natural monuments. The flora of Australia, and especially that of Queensland, is unique and of great scientific value, and also, in some instances, of high commercial value. Assisted by her isolation from other land system of the globe, Australia has developed a distinct flora of her own, and through wholesale spoliation many of our valuable plant specimens are in danger of extinction. The flora of this continent concerns the world in general, and we may be regarded only as trustees of the floral wealth with which it abounds. Unfortunately, much of our natural beauty has already been destroyed, and this measure is designed to check a thoughtless or selfish tendency towards wanton spoliation and a spirit of wastefulness and destruction. Our native flora has a really national significance, and in our exploitation or wilful destruction of indigenous plants, æsthetically or commercially valuable, we have allowed our national pride and thoughts for the needs and pleasures of future generations to be overcome. There is always a danger in interfering unwisely with natural features, the value of which is too seldom realised or even thought of. We all know of numerous instances of individual vandalism—and even organised vandalism—through which posterity has been robbed of its undoubted right to enjoy the beautiful things of nature in a country which, from a scientific point of view, is unique in its vegetation and bird and animal life. In all these things we hold a trust, not only for our people, but for the world at large.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of the Bureau of Sugar Experiment Stations.

PART XII.

(*c*) Mills and Milling Work—*continued.*

IN the last instalment of this series it was stated that there were fifteen vacuum pans in Queensland. An engraving of one of these early pans has been kindly supplied by Mr. W. G. Gibson, of Bingera Plantation, and is shown below:—

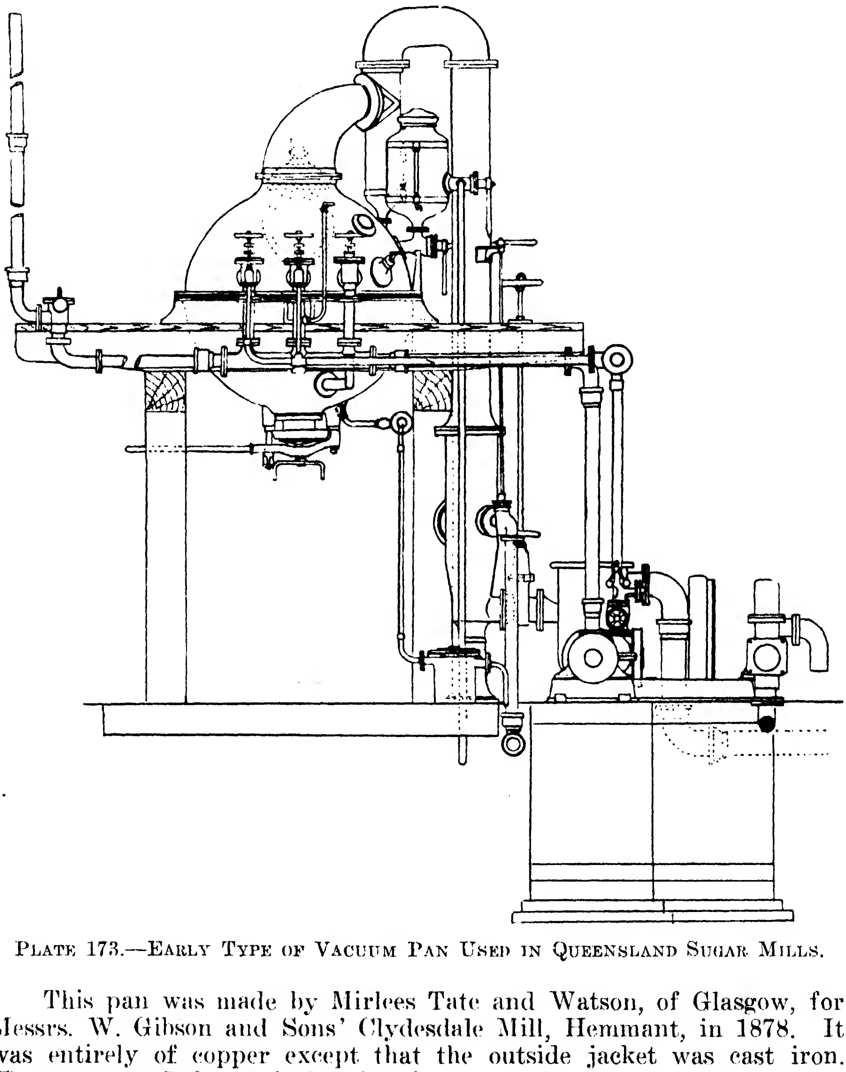


PLATE 173.—EARLY TYPE OF VACUUM PAN USED IN QUEENSLAND SUGAR MILLS.

This pan was made by Mirlees Tate and Watson, of Glasgow, for Messrs. W. Gibson and Sons' Clydesdale Mill, Hemmant, in 1878. It was entirely of copper except that the outside jacket was cast iron. The pan was 5 feet 6 inches in diameter by 5 feet deep, and had a capacity of 1½ ton of sugar. It was used till about 1886 and then transferred to the Rocky Point Mill. I understand it was scrapped about 1921.

In 1880 there were stated to be eighty-three sugar-mills in Queensland as under:—

Cardwell District	2
Mackay District	16
Maryborough and Bundaberg	23
Brisbane District	19
Logan District	23
	83

The production in Queensland that year was reported to be some 15,000 tons of sugar.

Historical facts in relation to the industry between 1880 and 1900 are difficult to secure. During the first decade there was no paper published entirely in the interests of sugar-growing. However, this period of twenty years was one of great development, and a large number of sugar-mills were established, principally in the Bundaberg and Mackay districts.

It was during the eighties that the first two Central Mills—i.e., Racecourse and North Eton—were erected, and it was, unfortunately, during this period that the bottom fell out of the sugar market, due to the rapid development of the European beet industry, and this rival to cane kept the price of sugar low for many years. The introduction of Central or farmers' mills into Queensland, however, was a big step forward and laid the foundation of the subsequent "White Australia" policy. The following extract taken from a booklet published in 1925 on the History of the Racecourse Mill at Mackay is of much interest:—

> "To the Racecourse Central Sugar Company Limited stands the undoubted distinction of having erected the first Central Mill to crush cane in Australia, and thus laying the foundation of the movement that finally wrested the industry from the hands of the black man. . . . prior to the formation of the company the industry was entirely in the hands of private enterprise, the capital being mainly supplied from England. Black labour in the form of Kanakas secured from the South Sea Islands was used in the fields, and (with the exception of a few technical occupations) in the mills."

When the question of farmers' mills was first mooted, there were thirty-one private mills in operation, sixteen on the north side and fifteen on the south side of the river, in the Mackay district.

The initiation of sugar-growing in the Lower Burdekin or Ayr district was said to be in 1879, though a mill was not erected till 1884 on Airdmillan Estate. Seaforth Estate and mill commenced operations in 1884; Kalamia, Drynie, and Pioneer also started crushing about this time.

The late John Drysdale, popularly known as the "Grand Old Man" of the Lower Burdekin district, arrived in Ayr in 1887, and he took a leading part in the development of sugar-milling and field work. He was a member of the firm of Drysdale Brothers. The mill they were so long associated with was the Pioneer, which was built by Spiller and Brandon, of Mackay, but before the mill commenced operations they sold out to Drysdale Brothers, and this mill also commenced crushing

in 1884. Before the arrival of Mr. John Drysdale the operations were carried out by Mr. George Drysdale. The irrigation system laid down by the latter was greatly improved on and extended by John Drysdale, who had been trained as an engineer. He was responsible for many of the improvements carried out in the Ayr district, which owes a heavy debt of gratitude to him. Later, he was responsible for the erection of the fine, up-to-date plant at Inkerman, on the south side of the Lower Burdekin River, and which has done so much to create a large settlement of contented sugar-farmers. His memory is perpetuated by a fine clock-tower in the main street of Ayr.

Owing to pressure of work this part is a very short one. In my next article I hope to be able to supply some further information of the earlier mills.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

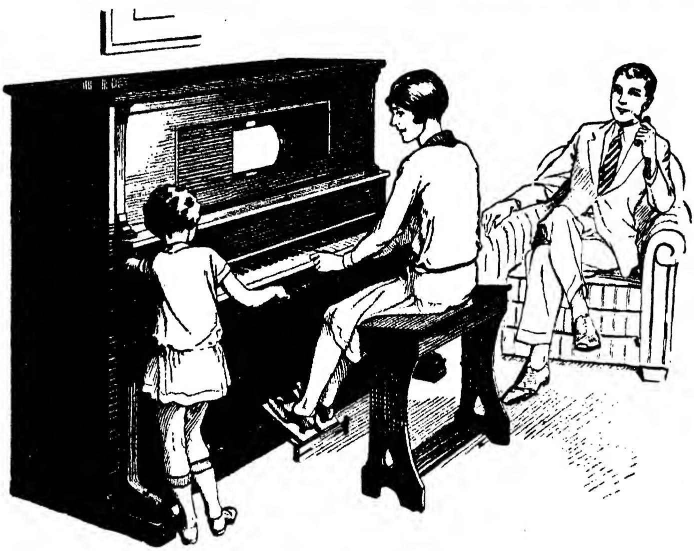
The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes for publication from the Assistant Entomologist at Bundaberg, Mr. R. W. Mungomery:—

FUMIGATION FOR CANE GRUBS.

At the present time and for the next few months cane grubs will be actively engaged eating the roots of the cane stools, and when sufficient numbers are present, their attack usually results in the total failure of the cane in the areas they infest. Several species of root grubs are involved in this destruction, but they are all alike in their ultimate effects on the plant, and, indeed, their habits are very similar. "Frenchi" grubs, however, have a more definite period of inactivity during the winter than some of the other common grubs, and when they resume feeding after this dormant period, they feed very ravenously, causing great damage to the cane, which, by its wilting and yellowing, soon shows unmistakable signs of their presence.

All of these cane grubs can be destroyed by soil fumigation, and this practice offers one of the best ways of dealing effectively with comparatively small outbreaks. By cleaning up small patches in otherwise even blocks of cane, not only may the cane be saved, but a check is placed on the increase of the pest. Young plant cane, by reason of the fact that these fumigants produce a severe wilting effect on cane at such an early stage of its growth, cannot be so treated, and it is essential that the land should, first of all, be thoroughly freed from grubs prior to being planted with cane. Grubs in old ratoons are best dealt with by ploughing out and hand-picking, and as a further aid in this connection, the rotary cultivator will be found very serviceable. This implement, with its revolving knives, cuts up the stools into small pieces, so that many grubs are either killed by it or they are more easily exposed by the ploughs, which later follow on this system of cultivation.

For grub attack in older plant cane or first ratoon cane, soil fumigation offers a remedy, and in order that supplies of fumigants may be on hand the moment grub damage first becomes apparent, the Bundaberg District Canegrowers' Executive has purchased a supply of fumigants, which are to be made available to growers at cost price. By careful experimenting we have found that a mixture of carbon bisulphide and liquid dichlorbenzene in the proportion of two of the former to one of the latter, has given a high percentage of deaths when injected into the soil to kill cane grubs, and this mixture is being made available to growers at £2 per 5-gallon drum. Injectors will also be loaned out at a nominal charge. These injectors deliver measured doses of fumigant into the ground, the usual practice being to inject the dose at a depth of 4 inches. The resulting fumes, which quickly penetrate the soil, soon over-power all insect life that comes within its effective radius. Two injections —one on each side of the stool, are generally given to normal-sized stools, but for



large spreading stools three or four injections may be necessary. For further particulars, growers are requested to call at, or 'phone, the Sugar Experiment Station, Bundaberg, where full particulars of these fumigants and the method of applying them will be given.

SUGAR YIELD.

The Director of Sugar Experiment Stations states that the yield of sugar in Queensland from the present crop is anticipated to be about 508,000 tons of raw sugar of 94 net titre. This will, if realised, be about 10,000 tons below last season. The export of sugar, it is anticipated, will be higher this year owing to decreased consumption in Australia. The cane crop is also lower than last year, and this is due to the dry period late last year and early in the present year.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has returned to Brisbane after visiting the sugar districts between Mackay and Cairns. The present crushing is proceeding satisfactorily without any labour or shipping difficulties, and at many of the mills the sugar is being cleared as quickly as it is manufactured. The prospects for the coming season are exceptionally bright, due to the recent splendid rainfalls in the Northern canegrowing areas.

The young cane was looking vigorous and healthy in all the sugar districts from Mackay northwards, and splendid crops are in sight for next season. The rainfall at Innisfail up to the end of October reached 150 inches, while at Babinda the amount registered was 186 inches. Most of this, however, has fallen since the beginning of April. Due to the earlier dry weather in February and March the crops from Ingham to Cairns are not quite so good as was originally expected. On the other hand, the sugar yield at Mackay this year will be better than was anticipated in June, as the commercial cane sugar in the cane is remarkably high in this district, and also at Proserpine.

It is anticipated that, due to the amount of rain that has fallen in the more Northern cane areas, an earlier emergence of the grub pest will be in evidence.

The Bureau hope to furnish an estimate of the present sugar crop within the next few days.

Plate 174.—Surprise Creek, Winton. A Favourite Picnic Spot.

BROWN SPOT OF THE PASSION VINE.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Introduction.

THE value of the passion fruit crop to Queensland is relatively small as compared with other classes of fruit. The crop nevertheless forms a very important adjunct to the establishment of young citrus orchards in some districts, and is commonly grown in connection with certain types of mixed farming. Although possibly justified from the commercial aspect, there are few instances where passion fruit are planted as a main crop. Moreover, an examination of the figures for the acreage under passion vines for the past few years discloses little increase in the area devoted to this fruit. This situation is to a large extent due to the reputation for uncertainty held by this crop, this uncertainty being due to the serious and sudden outbreaks of disease to which the passion fruit is liable.

As little definite knowledge was available concerning these epidemics, and still less concerning their satisfactory control, investigations were commenced in 1926 and have been continued at somewhat disjointed intervals since then.

It has been found that most of the loss may be attributed to one or more of four distinct diseases. These are: (1) Brown spot, a fungus disease caused by a species of *Macrosporium;* (2) powdery spot and fruit scab, with which is associated a *Cladosporium sp.;* (3) a crown rot, the definite cause of which is at present in doubt so far as Queensland is concerned, but which closely resembles a disease occurring in New South Wales, where it is attributed to the action of *Fusarium sp.;* (4) woodiness, a disease of the virus type. Of these diseases, by far the most serious in Queensland is brown spot. The disease, powdery leaf spot and scab, is mainly restricted in its occurrence to the cooler months, and attacks only the young growth and fruit. Crown rot may at times be responsible for considerable loss, but as this disease appears to be to a certain extent dependent on other contributory conditions, such as poor cultivation, the presence of brown spot, &c., for its serious development, it is not held to be of great primary importance. Woodiness, which is of major importance in New South Wales, is fortunately not to the same extent prevalent in Queensland. Possibly the temperature factor stressed by Noble[7] in a recent paper dealing with the disease is to some extent responsible for this freedom. Several other leaf and fruit troubles may at times appear, but in comparison with those previously mentioned they are of a minor nature and rarely cause loss of any economic significance. The disease, brown spot, will now be considered in more detail.

Symptoms.

Brown spot may attack all aerial portions of the vine, and the symptoms displayed are usually quite characteristic of the disease. On the leaves the first symptoms consist of a minute brown dot which enlarges to a more or less circular spot 2 to 3 mm. in diameter and often possessing in the early stages a suggestion of translucency. The spots may shortly show a differentiation into a lighter central area or may retain a uniform shade of dark chocolate brown (Plate 175). When suitable moisture conditions obtain, such as during periods of wet weather, a spot may further enlarge, and there appears a definite water-soaked margin to the old spot limits. The different stages of growth

PLATE 175.
Brown spot on leaves of the passion vine (*P. edulis*).

later become evident in a faint concentric ridging, and in a variegation of the shades of brown—the darkest being towards the margin, while the central region is often not more than a light grey. Older spots may attain a diameter of 1 to 2 cm., and may be rounded or angular in shape.

The spores of the fungus causing the disease may often be seen forming a fine, dusky coating over older spots usually more abundant on the lower surface.

Fruit appear to be most commonly attacked from the time they are about half-grown until almost ready to colour. The lesion appears first as a minute dark-green water-soaked spot with an almost indistinguishable light-brown speck in the centre. The light-brown centre gradually enlarges to form a more or less circular area of uniform brown, sometimes retaining the water-soaked region as a narrow dark-green border. When over 2 mm. in diameter the spot usually becomes somewhat sunken, and after reaching about 2 cm. the marginal tissue becomes wrinkled and contracted (Plates 176, 178). Unless invaded by secondary organisms the spot remains firm and the fruit shrivel up without presenting a wet rot.

On the branches the lesion commonly takes the form of a dark-brown area extending 2 to 4 cm. or more up and down the runner. This affected area is, in the majority of cases, associated with the leaf axils and is usually at first confined to that side of the runner from which the tendril and leaf is given off (Plate 177). Eventually complete circling and consequent cincturing may take place. As the lesion ages it becomes greyish brown in colour and often bears a sooty mass of Macrosporium spores as well as pustules of various saprophytic fungi.

Effect of the Disease on the Vine.

The effect of brown spot on passion fruit culture is twofold. There is the indirect loss occasioned by the reduction of foliage and runner, and the direct loss, when the fruit are attacked.

A characteristic feature of the disease is the rapidity with which abscission of the leaves takes place when these are affected. The presence of the fungus in even a single lesion is sufficient to cause a leaf to fall shortly after the appearance of the spot—in many, if not the majority of cases before spore formation has commenced. The result of a severe outbreak is to leave the vines practically devoid of foliage and consisting merely of an interlaced network of bare runners (Plates 182, 183). Although the runners, unless themselves attacked, will often come away again, this defoliation will cause a set-back of several months duration. Young buds also fall readily if they become spotted, and much loss may be occasioned should the disease be prevalent during the flowering stage.

Probably the greatest damage is done when the runners themselves are attacked. The leaves and fruit on several feet of runner may suddenly wilt and wither. On tracing back the affected branch there will usually be found a brown spot lesion which has worked round and through the runner until the distal portion is completely cut off from the main vine. It is doubtful whether the older runners are ever infected directly, but there is evidence to suggest that the disease may work in from an infected young lateral and eventually cincture the larger branch. This cincturing is not necessarily a quick process, and its effect may show up in the spasmodic wilting of individual runners long after the actual infection took place. For this reason the origin of the wilting is often puzzling to some growers.

Plate 176.
Brown spot on passion fruit.

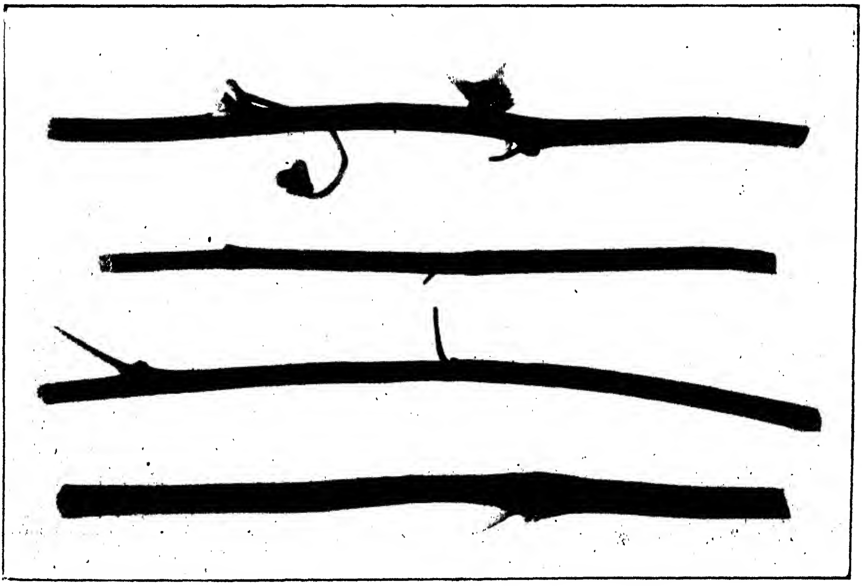


Plate 177.
Brown spot lesions on the stem of the passion vine. The upper specimen shows infection commencing both at the leaf axil and apart. The lower illustrates complete cincturing.

The combined result of a severe attack of brown spot is to cut back the vine to the main stems. New shoots may be produced from these during the next season, but in the meantime valuable intermediate crops are lost. Often the vine will not recover and whole plantings have been destroyed by this means under conditions favourable to the development of the fungus.

An important factor augmenting the seriousness of brown spot is that the set-back given by a bad attack often appears to be able to upset the balance sufficiently to enable collar rot to gain the ascendancy and completely kill a vine. A healthy and vigorous vine is usually able to form new tissue in pace with the invasion of the rot so that little actual damage results.

Fruit bearing small spots may be marketable for pulping purposes as the pulp is usually unaffected in these cases. Fruit bearing larger lesions are of course valueless. The loss occasioned in this way may be considerable as may be judged by a count made on coloured and colouring fruit from two short rows. This showed that out of 317 fruit 228 or 72 per cent. were affected with brown spot.

Under ordinary plantation conditions the severity with which a vine is attacked by brown spot is usually found to be directly related to its age. Vines up to two years old usually do not suffer to a great extent, but from then on the older the vine the more severely is it attacked. After an epidemic it is often a simple matter to pick out the relative age of the rows from the state of the vines. This is not considered to be due to a loss of resistance but to the great increase in the mass of foliage and vine in the older plants. Pruned vines exhibit no increase in susceptibility with age.

Distribution.

Brown spot appears to be distributed throughout South-eastern Queensland, and as a consequence the more important passion fruit producing centres have the disease well in evidence. The most northern limit from which brown spot has been recorded is the district of Waterloo, 230 miles North of Brisbane. As will be seen later there is evidence that an allied form of the disease exists further north, the granadilla being the sufferer in this case.

The origin of brown spot in Queensland is obscure. The first authentic record of its occurrence was made by Tryon[2] in 1912, and the disease was evidently already well established at that time.

It is interesting to point out in this connection that while this disease has been found affecting under natural conditions three other introduced South American species of *Passiflora* none of the native species is attacked.

History of the Disease.

The first available reference to a disease apparently resembling the one under discussion is to be found in a paper written by Cobb[1] in 1903 in which are discussed certain passion vine diseases of New South Wales. Reference is here made to a fruit spot with which is associated a species of *Macrosporium*. As neither the descriptions of the disease nor the associated organism agree satisfactorily with the facts as they obtain in Queensland, it is not possible to decide definitely on any relationship between the two diseases.

Tryon[2] (1912) in a preliminary report on a disease of the passion vine in the Cleveland district, Queensland, describes symptoms identical with those of brown spot. He attributes the cause of the disease to the presence of a species of *Helminthosporium.* It is, however, probable that in his first naming of the casual organism Tryon was misled by the fact that it is characteristic of the *Macrosporium* found fruiting on brown spot lesions to produce spores with few or no longitudinal septa, as in the Annual Reports for 1917[3] and 1918[4] he refers to a leaf spot caused by a *Macrosporium sp.* allied to *M. cucumerinum.*

In Victoria, Farrol[5] (1923) refers to a disease which from the description and illustrations given closely resembles in its symptoms the brown spot of Queensland. He, however, gives as the casual agent *Glœosporium sp.*

In the leaflets of the Department of Agriculture, New South Wales[6] (1923, 1926), a similar disease is described and attributed to *Glœosporium fructigenum.* Noble[7] (1928) also mention brown spot, caused by the fungus *Glœosporium fructigenum* Berk as being responsible for serious loss in New South Wales.

Cause of Brown Spot in Queensland.

In Queensland all evidence obtained points to the fact that the disease so far as this State is concerned is due, as was first indicated by Tryon, to a species of *Macrosporium.*

Extensive isolations made by single spore and tissue plantings from typical lesions on leaves, fruit and stems, consistently yielded this organism. Typical lesions can readily be obtained on all the abovementioned parts by inoculation of mycelium taken from pure cultures of the fungus. Ten different strains have yielded positive results in this way. From these lesions the *Macrosporium sp.* can be re-isolated.

Glœosporium pustules are not uncommonly found associated with brown spot lesions, though usually in a position suggesting their presence in a secondary capacity. Inoculations with strains of *Glœosporium* isolated from such associations have in no instance produced typical lesions—the usual result in these cases being little or no development differing from those of the controls.

A species of *Glœosporium* is, however, apparently responsible for a distinct disease. This consists of a leaf spot and a small white stem canker. The former takes the form of an opaque, whitish lesion of from ½ to 2 cm. diameter sharply delimited by the veins of the leaf to a definitely angular shape. A few black Glœosporium pustules may be present on the otherwise uniformly light surface.

Morphological and Cultural Characters of the Causal Organism.

Under suitable natural conditions spores of the *Macrosporium sp.* associated with brown spot are formed on the older leaf, fruit and stem lesions in abundance. In culture spore formation has only been obtained by the special method described by Rands[8] and then only in the case of certain strains. Some considerable difference in spore dimensions appears in measurements made from field material obtained in southern districts and in those obtained from a more northern situation near Bundaberg. Spores obtained in cultures from both places are, however, in close agreement although differing again from those naturally produced. The difference is mainly due to the size of the beak which is greatly reduced in the northern form as compared with the southern and is specially well developed in culture. The dimensions will be found in Table 1.

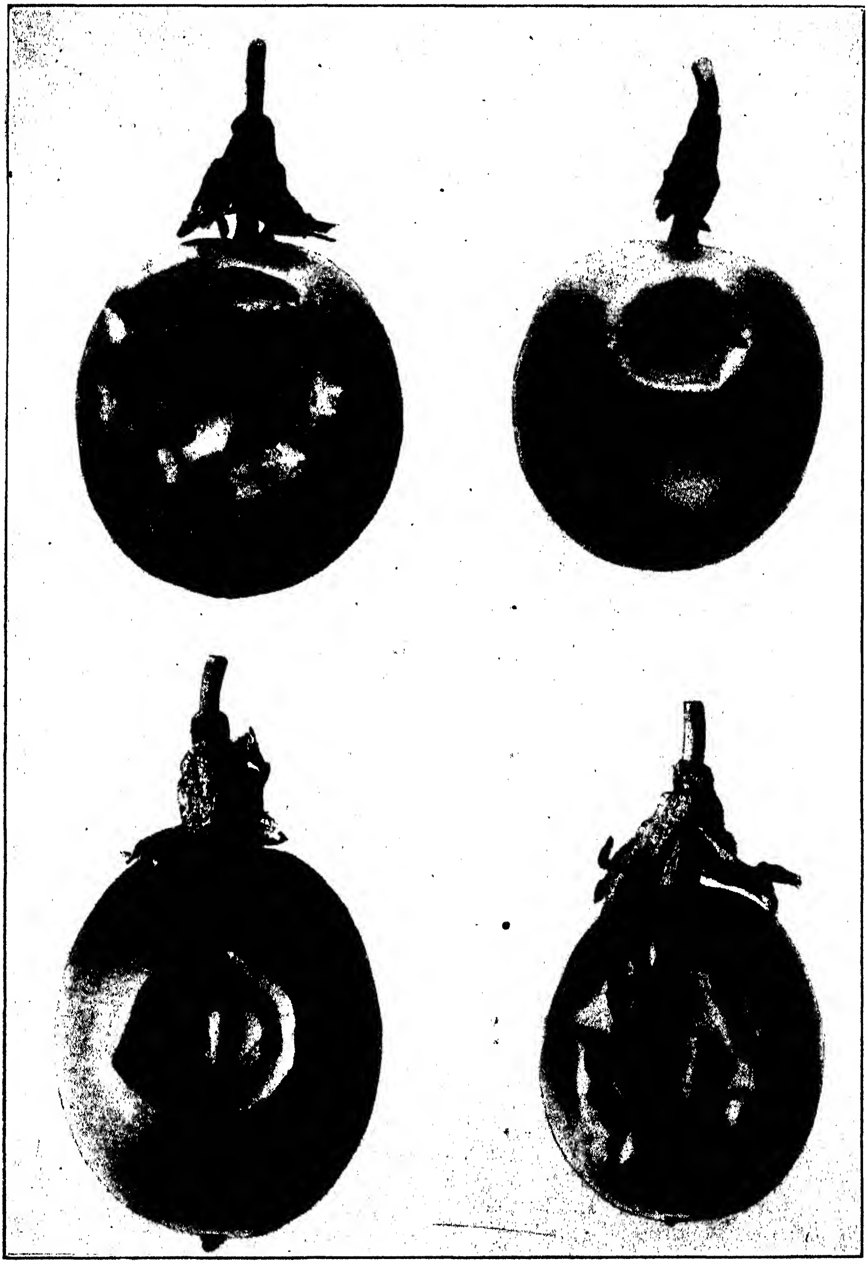


PLATE 178.

Upper: Passion fruit naturally infected with brown spot. Lower: Fruit artificially inoculated with a culture of the *Macrosporium sp.*, from *P. edulis*.

The spores of the passion *Macrosporium sp.* resemble in general appearance those of *M. solani* E. and M. as described by Rosenbaum[9] and as a characteristic have their septation largely restricted to transverse divisions of which there may be 5 to 13 with an average of 8·7. Longitudinal and oblique septa are in many entirely absent, the average being 2·5. Definite muriform septation is rare. The beak is rarely forked in the naturally formed spore, but in culture as many as five branches may be formed with two and three appearing most commonly. The length of the beak is also increased on culture material.

TABLE I.

SPORE MEASUREMENTS OF THE *Macrosporium* CAUSING BROWN SPOT OF *Passiflora spp.*

Origin.	Number Measured.	Length of Body.		Length of Body plus Beak.		Width.		Number of Transverse Septa.		Number of Longitudinal Septa.	
		Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.
P. edulis (natural)	80	64–116	87	108–240	168	15–26	20	5–13	8·4	*	2·5
P. edulis (culture)	40	66–108	85	186–305	253	18–24	20	6–12	9·1	0–8	2·6
P. edulis (northern form, natural)	20	54–102	70	87–150	106	16–27	21	5–10	7·6	0–4	2·6
P. edulis (northern form, culture)	20	69–105	86	191–305	249	18–23	21	8–12	9·6	0–7	2·7
P. alba (natural)	50	60–114	80	96–212	151	14–26	18	5–12	8·3	0–10	1·8
P. quadrangularis (natural) ..	60	44–135	88	92–232	179	14–24	19	6–12	8·7	0–7	1·8
P. foetida (northern form, natural)	35	30–75	46	54–117	71	12–21	16	3–11	6·8	*	3·4

* 0–muriform.

A typical fourteen-day-old culture on potato dextrose agar slope takes the form of a fairly close-growing, light-grey, cottony growth with not usually more than 5 to 6 mm. marginal extension round the glass. Later the surface becomes compacted and smooth. Substratal growth is black. The colour of the media may remain unaltered, or it may change to various shades of brown or occasionally to a deep reddish brown, depending on the strain under observation. Accompanying the darker discolouration of the media there is often an orange or reddish-brown zonation of the mycelium, especially in old cultures.

No perfect stage has been found associated with the *Macrosporium sp.* of brown spot. Such a stage is not deemed necessary for the life history of the organism, as sufficient lesions are present throughout the year to ensure a continuity of spore material. The spores themselves may remain visible for considerable periods, as may be judged from the following figures for longevity taken from material kept in the laboratory:—

TABLE II.—LONGEVITY OF SPORES.

Age of Spores.	Per Cent. Germination.
19 months	13
16 ,,	30
2 ,,	72
A few days	100

41

Temperature Relationships.

On potato dextrose agar the *Macrosporium sp.* has been found to grow readily at temperatures between 20 deg. and 29 deg. Cent. On the lower side growth falls away gradually until it becomes very scanty at temperatures approaching freezing point. Above 30 deg. Cent. growth diminishes rapidly and ceases entirely round 35 deg. Cent. The optimum temperature ranges from 23·5 deg. Cent. to 28·0 deg. Cent. according to the particular strain under observation. So far as can be judged from the limited number of series available, there is no appreciable difference between strains derived from either *P. edulis, P. alba*, or *P. quadrangularis*, three known hosts of the species of *Macrosporium* in question. These relationshipships are illustrated graphically in fig. 1.

Spore germination follows the same general scheme of temperature reaction as does mycelium development.

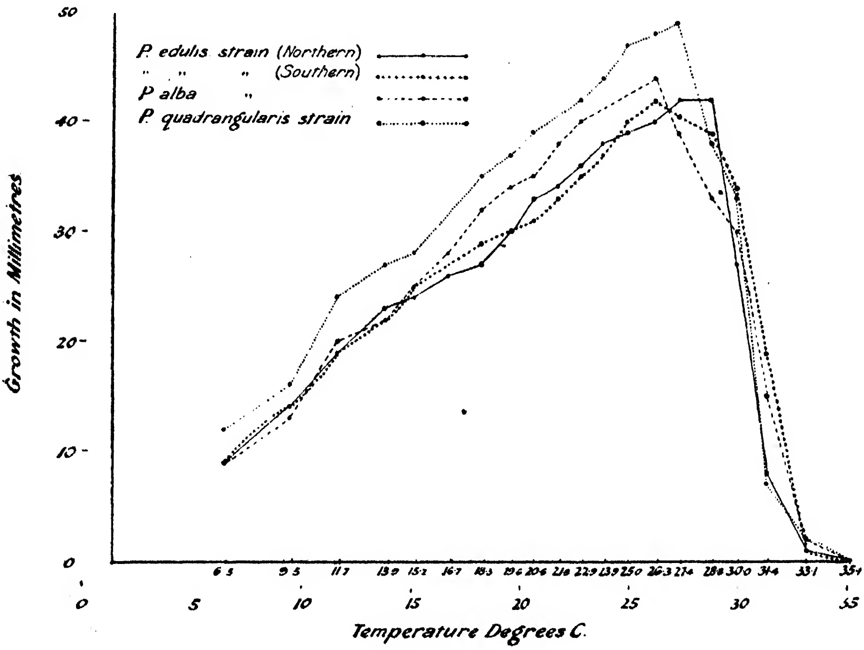


PLATE 179.

Fig. 1.—GROWTH-TEMPERATURE CURVES FOR FOUR STRAINS OF THE *Macrosporium sp.* ASSOCIATED WITH BROWN SPOT. Six days growth on potato dextrose agar at twenty temperatures ranging from 6.5 deg. Cent. to 35.1 deg. Cent.

Seasonal Conditions contributing to Brown Spot Development.

Owing to the fact that seasonal observations of this passion vine disease were necessarily of a somewhat disjointed nature, it is not possible to indicate relationships between weather conditions and brown spot other than in a general manner.

It is possible to find odd leaves affected with brown spot at all times throughout the year. However, the disease is not usually present to any marked extent, except during the period from August to March inclusive.

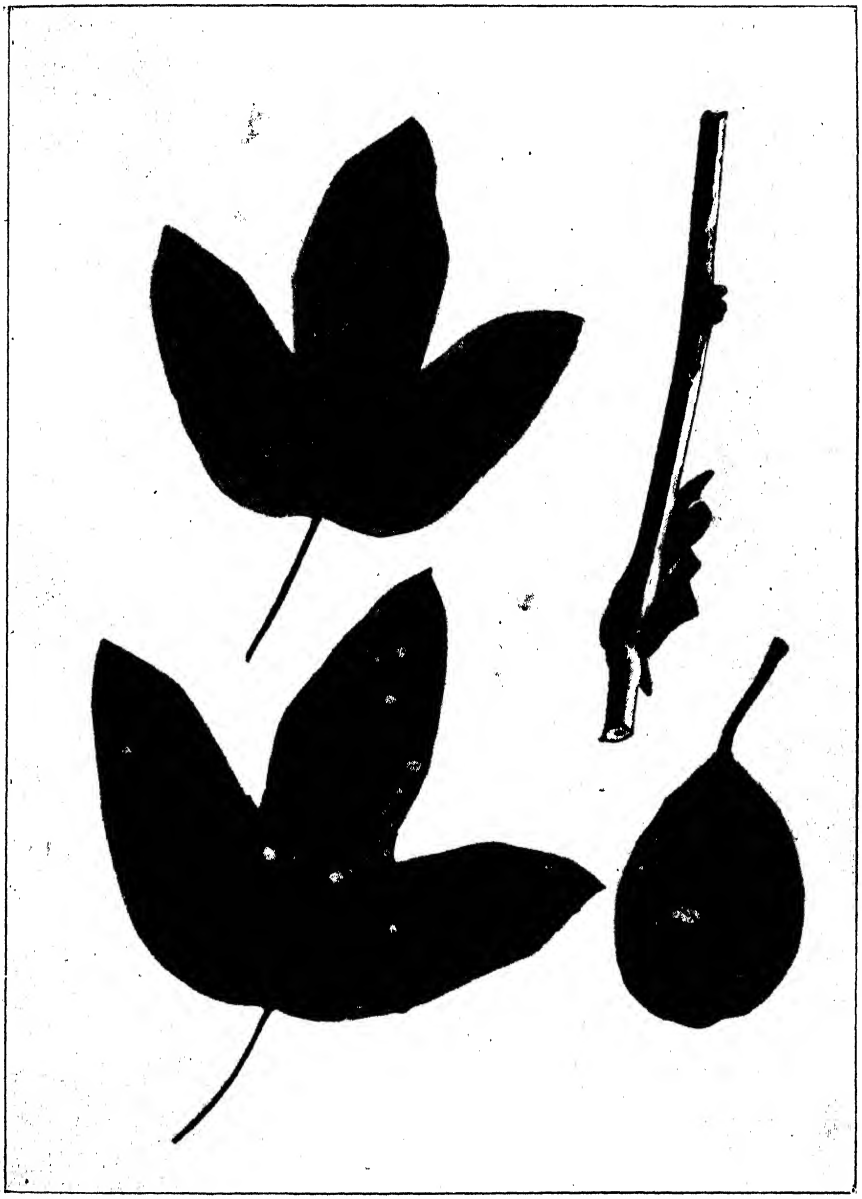


PLATE 180.
Brown spot on the leaf, stem, and fruit of the white passion flower (*P. alba*).

During the other four months rainfall is normally low and the temperature as a rule averages less than 15 deg. Cent., with the result that brown spot is usually of secondary importance to powdery leaf spot and scab. Serious epidemics usually follow a period of several days wet and muggy weather. These conditions are apparently also necessary for abundant spore formation.

The usual course of events is for the disease to gradually increase in prevalence during the spring and early summer months to culminate in a more or less serious defoliation about December and January, the seriousness of the attack being largely determined by the extent and nature of the rainfall during the latter months of the year. Thus, for example, brown spot was not nearly so serious following light spring rains in 1926 and 1928 as in the 1927-1928 summer, when rain towards the latter end of 1927 was abundant. Smaller outbreaks may occur during later summer months but these are not as a rule of such serious consequence.

Varietal Susceptibility.

The common purple passion fruit is highly susceptible to brown spot as may be judged from the remarks already made in this article. The only other variety which is grown to any extent on a commercial scale is the "mammoth" characterised by somewhat larger leaves and fruit. When judged against the plantings of the common vine growing in the same locality this variety appears to be equally susceptible to the disease. Other varieties such as the "yellow" passion fruit and species of *Taxonia* are not grown in sufficient quantities for their relative resistance to be ascertained. The fact that the fungus readily attacks three other species of *Passiflora* would suggest that the chance of obtaining a resistant variety of *P. edulis* is not favourable.

Other Hosts.

(1) The White Passion Flower.

There are to be found in Queensland several species of the genus *Passiflora*. Of these the commonest and closest ally of the common edible passion fruit (*P. edulis* Sims.) is the white passion flower (*P. alba* Link and Otto), a Brazilian plant which is commonly to be found in the naturalised state throughout coastal Queensland. This plant is usually to be found on the edges of scrub clearings and is particularly abundant at Tamborine Mountain.

The white passion flower is commonly found affected with a fungus disease whose general appearance suggests a similarity to the brown spot under discussion. Lesions are produced on leaf, stem, and fruit, identical with those found on the edible passion, with the exception that on *P. alba*, owing no doubt to some difference in chemical composition, the spots are of a deep purple rather than brown colour. The natural effects, such as leaf fall and stem cincturing, are found as in the case of the cultivated species. Isolations from leaves, fruit, and stem lesions by tissue planting and single spore methods yielded a fungus culturally identical with that obtained from the cultivated vine. Inoculation of six of the *P. alba* strains of *Macrosporium* into *P. edulis* fruit and stem gave positive results in each case. Equally as good development was obtained as when *P. edulis* itself was the origin of the inoculum. The reciprocal inoculation has not been attempted.

The spore characteristics and measurements of the *Macrosporium* obtained from lesions on both species of *Passiflora* are in close agreement (Table 1). The temperature reactions of the two strains are also similar (Fig. 1).

It would therefore appear that the disease on the two hosts is identical. Little difference can be noted in the extent of infection in the two plants. It has not been found possible to theorise as to which *Passiflora* species was the original host for the fungus.

Theoretically passion fruit growers should be advised to destroy all plants of the white passion flower growing in the vicinity of their plantations. The condition of the cultivated passion vines themselves on most farms would suggest that such a high percentage of infection must arise from these alone, that the part played by the wild vines is insignificant. Any grower, however, who intends to systematically treat his vines for brown spot should also keep the white passion flower in check as far as possible.

(2) The Granadilla.

The granadilla (*P. quadrangularis* Linn.) is also affected with a fungus disease producing a brown leaf spot and a spot on the fruit. The lesion on the leaf closely resembles the brown spot of the passion vine. On the fruit, which possesses a thick soft rind, there may be produced eventually large pyramidal excavations 2 to 3 cm. in diameter and somewhat less in depth. (Plate 181.)

By using tissue planting and single spore methods there has been obtained from lesions on leaves and fruit of Brisbane-grown granadillas a *Macrosporium* which differed very little, if at all essentially, as regards cultural characters from those strains of *Macrosporium sp.* isolated from *P. edulis* and *P. alba*. The spore characteristics and measurements agree fairly well with those from the latter hosts. (Table 1.) Typical lesions were produced by inoculation of this granadilla strain into passion fruit. Inoculations of the *P. edulis* and *P. quadrangularis* organisms into granadilla fruit were also successful. (Plate 181.)

The granadilla being a more tropical plant than the passion vine, is found more extensively grown in the Northern districts of Queensland. It is there subject to a brown leaf and fruit spot closely resembling in general characters the disease just described from the Brisbane district. However, although a *Macrosporium* was associated with the Northern form of the disease, this organism showed considerable difference culturally and as regards spore measurements from the *Macrosporium* strains described above. Nevertheless, when inoculated into passion fruit, cultures of one of these Northern species produced definite and fairly typical brown spot lesions. Further work is necessary in connection with brown spot as it occurs on the granadilla, but it is considered likely that while the organism obtained from *P. edulis, P. alba,* and the Brisbane grown *P. quadrangularis* evidently represent closely allied strains of the one species, the Northern form is possibly distinct.

(3) Passiflora foetida.

More recently there has been noted at Waterloo, a district some 250 miles north of Brisbane, a leaf spot and stem cincturing of the more tropic-loving Passiflora, *P. foetida* Linn. The lesions on this plant were practically identical with those occurring on *P. edulis* and *P. alba,* plants of both of these latter species in the same locality being heavily infested with brown spot.

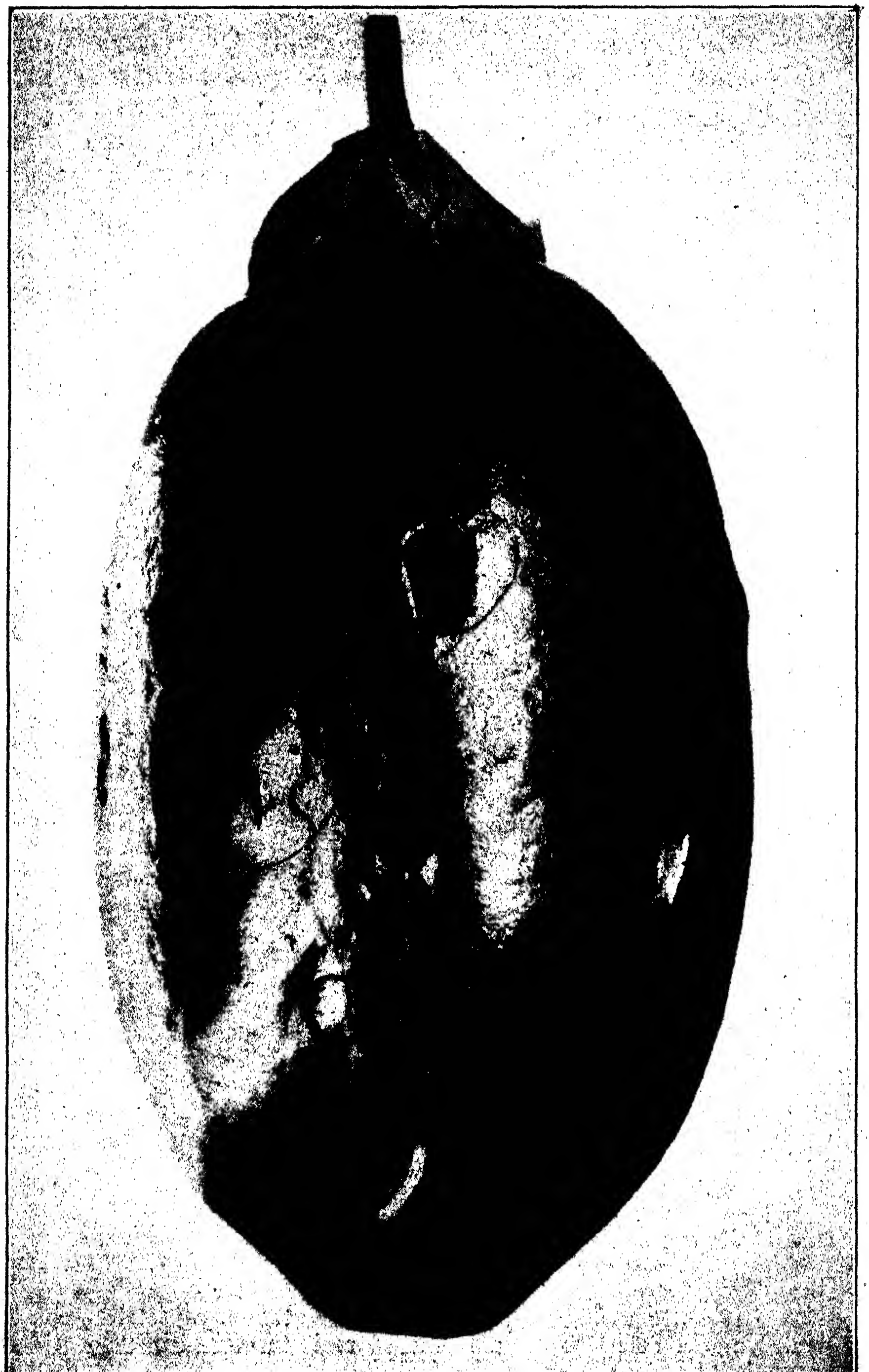


PLATE 181.

Granadilla inoculated with single spore cultures of the *Macrosporium sp.* from brown spot. Upper: *P. quadrangularis* strain. Right mid and lower: *P. edulis* strain. Left mid: Uninoculated control.

Outbreaks of Insect Pests and Diseases

The Division of Entomology and Plant Pathology welcomes inquiries regarding outbreaks of insect pests and diseases. If details of such outbreaks are forwarded to the Department of Agriculture and Stock, advice will, wherever possible, be tendered regarding the life-history and control of the insects, fungi, or bacteria responsible for these epidemics. Specimens of the attacked plants should invariably accompany the inquiries, and these should be addressed to the Chief Entomologist; in the case of entomological inquiries, specimens of the insects responsible for the injuries should also be supplied.

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock.

Cultural characters and spore measurements of the *Macrosporium* associated with *P. foetida* lesions present certain differences from those of the organism from the cultivated vine although inoculations proved the *P. foetida* organism capable of producing typical lesions on *P. edulis.* However, it may be pointed out that the spore measurements of the Northern form of the *P. edulis Macrosporium* also present considerable differences from the Southern.

Other species of *Passiflora* growing in Queensland—*P. suberosa* Linn., *P. Herbertiana* Lindl., and *P. aurantia* Forst., the two latter being native species—have not so far been found affected with a disease akin to brown spot. It is interesting to note that *P. Herbertiana* is a probable host for the species of *Cladosporium* associated with the powdery spot and fruit scab of the passion vine, while *P. alba* at times harbours a closely allied strain of this fungus.

Control Experiments.

Experiments designed to effect a control of brown spot and other foliage diseases of the passion vine were commenced towards the latter end of 1926. Suitable vines and facilities for preparing the sprays were kindly placed at the disposal of the Department by Messrs. H. Bishopp and J. Dunlop, of North Tamborine, to whose generous help we are greatly indebted.

PLOT A.—Early in October, 1926, applications of Bordeaux (6:4:40), lime sulphur (1 in 30), Burgundy mixture (6:8:40), and culcal (a copper sulphate-lime dust) were made each to one of four pruned rows of vines.

PLOT B.—The same treatment was applied to each of four unpruned rows.

These eight rows were at the time two and a-half years' old, were 1¼ chains long, and contained six vines. These applications were repeated in November and again in December. Suitable adjacent rows were left as controls.

Little disease developed during the season, and the effectiveness or otherwise of the applications could not be determined. It was subsequently found that the majority of the vines pruned and sprayed with Bordeaux and Burgundy and a few of those treated with lime sulphur were sufficiently improved to enable them to live, whereas the dusted and control rows died out completely twelve months later.

It was shown that no practical result can be expected from spraying an old unpruned vine, as the mass of foliage accumulated effectively prevents efficient covering by the spray. It was also found that the ideal conditions necessary for obtaining satisfactory covering and adherence of a dust on a leaf as shiny as that of the passion vine practically precludes any but the wet method of treatment. Dusting was therefore not attempted in subsequent trials.

1927-28 Season:

The experiments were taken up again towards the end of October, 1927.

PLOT A.—The four rows pruned and treated in 1926 were again pruned, and alternate rows sprayed with Bordeaux 6:4:40 and lime sulphur 1 in 30. That row receiving Burgundy the previous year received Bordeaux on this occasion, and the dusted row received lime sulphur.

PLOT B.—The four rows treated but not pruned in 1926 were cut well back, heavily fertilised, and sprayed as for the first four rows. This treatment proved too severe owing to the poor condition the vines were in at the time, and they subsequently died back to the crown.

PLOT C.—In addition to the above, five rows of younger vines twelve months planted out and each containing eight vines were treated as follows:—

No. 1.—Pruned; fertilised 3 lb. per vine of a mixture containing 4·5 per cent. ammonia, 8·9 per cent. phosphoric acid, and 15·8 per cent. potash; sprayed Bordeaux (6:4:40).

No. 2.—Received the same treatment as row 1 except that lime sulhpur (1 in 30) was substituted for Bordeaux.

No. 3.—Pruned and fertilised only.

No. 4.—Control—untreated.

No. 5.—Pruned only.

No difference was noted with respect to either yield or disease occurrence between the manured and the unmanured vines which were growing in a red basaltic loam, and the manuring was not therefore repeated.

The pruning and first spray application were made on the 26th October, 1927. Six further applications of spray were made during the 1927-1928 season.

Results: PLOT A.—A few months after the time of the first spray application the controls for this plot had died out completely as a result of brown spot and crown rot.

Of the treated rows (pruned and sprayed, and pruned also in 1926) those receiving Bordeaux made good growth which was maintained by similar treatment in subsequent years, until other operations necessitated their removal at the end of 1929. At this time when nearly six years old, these two rows were considered among the most productive on the plantation.

PLOT B.—The treated rows (heavily pruned and sprayed but not pruned the previous year) did not recover from the severe treatment they had received from the disease and the pruning and were of no further use in the experiment.

PLOT C.—Of the five rows of younger vines it was noticed throughout the year that the Bordeaux treated row, and, to a slightly less extent, the one receiving lime sulphur, were comparatively free from brown spot and grey powdery spot. The disease was slightly less effectively controlled on the rows pruned only. The controls at certain periods exhibited considerable brown spot with consequent leaf fall. Serious epidemics were, however, absent during this year of the experiment.

1928-29 Season.

PLOTS A AND C.—Towards the end of September, 1928, the annual pruning took place, followed by the usual spray applications. The various rows received the same treatment as in the previous year. The spraying was repeated six times during the ensuing twelve months at from one to two months intervals. Taken over the whole of this time the results indicated that Bordeaux spray on pruned vines will effectively

PLATE 182.

Three-year old untreated vine from control row of Plot C. Photographed, 12th December, 1929. A mass of defoliated and dead runners, and very few fruit present. *Cf.* Plate 184.

PLATE 183.

Four-year old untreated passion vine. Photographed, 12th December, 1929. Almost complete defoliation and die-back, resulting from brown spot.

control brown spot in all its various manifestations. Lime sulphur is slightly less effective. Pruning alone, while somewhat less successful again, yet gives very fair control and does not allow of the extreme defoliation and runner cincturing met with in the check rows. A count made on one occasion of ripe or colouring summer crop fruit from treated and control rows will illustrate this.

	Sound.	Affected brown spot.
Pruned and sprayed witn Bordeaux	44 ..	2
Pruned and sprayed with lime sulphur ..	29 ..	5
Pruned only (average two rows)	40 ..	21
Control (average two rows)	44 ..	114

It will be noted that the wastage due to pruning was in this instance almost made up by the increased proportion of healthy fruit borne by the pruned vines. It might appear from these figures that in spite of the disease the untreated control row would be the most commercially successful. However, reference to the yield from subsequent crops usually shows otherwise. Moreover, in a year of severe brown spot incidence, the chance of obtaining any intermediate or even winter crop off any but young vines when untreated is very small.

1929-30 Season.

PLOT A.—The four rows of old vines in this plot representing the original vines experimented with were left unpruned, as it was intended to remove them after the summer crop as the land was needed for other purposes. Spray applications were made in October and December. Ammoniacal copper carbonate replaced Bordeaux in the spraying schedule, as it was desirable to find an effective spray that would not stain the fruit.

Results:—In October the vines, now six years old, were carrying a very heavy summer crop and represented probably the most productive vines in the plantation. It will be remembered that the controls of this series died out two years previously and checks had to be made against other younger, untreated vines in the plantation. However, although sprayed they soon began to show the effects of not having had the usual pruning, and by the end of January were fairly heavily affected with brown spot.

PLOT C.—On 10th October, 1929, the vines of this plot received their annual pruning and spraying as in previous years with the exception that ammoniacal copper carbonate replaced the Bordeaux in row 1. A second spray was given in December, but opportunities were available for making only two further applications during the next six months.

Results:—The pruned and sprayed and the pruned only rows made the usual rapid growth and presented a marked contrast to the check rows throughout the ensuing twelve months, although towards the end of winter the absence of the usual number of spray applications made itself felt to a certain extent.

Plates 185 and 182 give some indication of the condition of the treated and untreated vines of this plot. Plate 184, representative of similar vines treated by Mr. Bishopp, is also interesting in this connection.

A careful record kept by Mr. Bishopp of the marketable fruit obtained from the experimental rows of Plot C for the winter crop

during July and August, 1930, is definitely in favour of the treatment. The counts were made from eight vines in each case.

(1) Pruned plus ammoniacal copper carbonate (Bordeaux previous years)	1,682
(2) Pruned plus lime sulphur	1,409
(4) Check untreated	112
(5) Pruned no spray	655

Conclusions from Field Experiments.

(1) Brown spot can be effectively controlled by systematic pruning and spraying.

(2) Spraying unpruned vines is ineffective.

(3) Dusting is likely to be of little use in connection with a plant such as the passion vine and under the conditions obtaining where this crop is grown.

(4) Bordeaux mixture was the most efficient of the fungicides used. This spray also appears to have somewhat of a stimulating effect on foliage and fruit production. Care must be taken not to apply Bordeaux during showery weather or severe burning of exposed runners is likely to occur.

(5) Burgundy and ammoniacal copper carbonate are also effective, but have not had a very extensive trial. The latter is probably about on a par with lime sulphur. A spreader can be used with advantage in the copper sprays.

(6) Lime sulphur when used with a casein spreader exhibits a better covering capacity than Bordeaux, but is somewhat less effective in its control of the disease.

(7) Pruning alone has been shown to give very fair control of all ordinary outbreaks of brown spot; in fact, pruning is considered to be the major factor in the control of this disease. So necessary is it considered to be that a special discussion of the merits and demerits of the procedure are given below. Fruit production from vines which have been pruned only does not appear to equal that from vines which have received spray as well.

Pruning.

The effect which pruning has on the control of brown spot can be explained as follows:

(1) Pruning stimulates the vine to healthy, vigorous growth.

(2) The thinning-out process allows a free access of light and air to all parts and prevents the formation of a moisture-holding mass of accumulated runner and foliage. It also enables a spray if such is being applied to reach all parts of the vine.

(3) Old stem cinctures can be removed, and as these are a prolific source of spores the spread of the disease is checked thereby.

(4) Probably the most important influence is due to the fact that infection of a leaf with brown spot usually leads to early abscission.

In the unpruned vines these leaves tend to be caught in the tangled mass of foliage and runner, and it is an easy matter for spores associated with the spots to be washed on to further healthy portions. In a pruned vine, however, it is usual for infected leaves to fall to the ground carrying any spores which may be present to a certain extent out of harms way. In many cases spore formation has not taken place before the leaf falls.

PLATE 184.

Three-year old vine similar to those of Plot C, pruned third week in August, 1930. Sprayed three times (Bordeaux). Photographed, 12th December, 1929. Good summer crop hanging. *Cf.* Plate 182.

PLATE 185.

Three-year old passion vine, from Plot C, pruned and sprayed with ammoniacal copper carbonate on 10th October, 1929. Photographed, 12th December, 1929. Healthy runners in preparation for intermediate crops. Summer crop light on account of late pruning.

It has further been shown that spore formation may take place on brown spot lesions after the leaf has become detached from the stem and even after the leaf has commenced to dry up, thus disclosing an additional source of danger in leaves held in the vine. It is common to find more or less concentrated patches of dead and dying leaves suggesting an origin from a single source such as a spore-bearing leaf remaining in the vine.

It is often observed by growers that passion vines growing wild on the borders of the scrub are affected little by the disease. This can be explained partly by the isolation from sources of infection and also by the fact that a vine growing under these conditions rarely makes a dense growth.

A further advantage to be derived from pruning is found in the stimulus given to fruit production and in the better quality of fruit obtained. It is possible to very considerably increase the quantity obtained from intermediate and winter crops when prices are at their best. Mr. Bishopp estimated that for the intermediate crop harvested in April and May, 1929, the Bordeaux sprayed and pruned rows yielded double the average of his untreated vines. Moreover, the fruit graded out at three firsts to one second, a considerable improvement on the quality of the rest of the plantation. The effect of pruning on the winter crop is shown in the figures given on page 581.

The main arguments against pruning are the time and labour involved, and the fact that it is usually necessary to sacrifice a portion of at least one crop during the pruning process. As regards the sacrificing of a portion of the summer crop, it is usually found that the added return from the off season fruit more than compensates for the previous loss.

It is interesting to note that, according to the records of the Government Statistician, the average annual return per acre over the last ten years for passion fruit was £93, while that per acre of grape vines was £58. Even allowing for some discrepancies in these figures, it still appears possible for the passion grower to devote with advantage more time to pruning and spraying, such time being spent as a matter of course in grape cultivation. In fact it is doubtful whether passion fruit growing will ever be placed on a satisfactory basis until the present haphazard methods give place to ones more comparable to those devoted to the culture of other fruits.

Time of Pruning.

As is pointed out in another section, brown spot usually reaches serious proportions only during the months from September to February, inclusive. Hence to be effective, pruning should take place early in this period. It has been found that by pruning when the summer crop has just commenced to set (usually some time in August in early localties or in September or October in cooler areas) a proportion of the summer crop is sacrificed, but a considerably better yield of intermediate and winter fruits is obtained. By pruning in August before the summer crop has commenced to form, a full summer crop is obtained, but it may be necessary in some districts to lose the latter end of the previous winter crop. When the latter method is adopted, the intermediate and winter crop cannot be expected to be as good as when the pruning is left until later.

By the time winter comes round the vines will be found to have formed a thick growth of leaves and runners, leaving no sign of having previously been heavily cut back. From the disease point of view this growth is not of such serious consequence at this time of the year, as powdery leaf spot is usually the only disease of consequence during the cold months, and to check this a spray needs to be applied principally to the young shoots and fruit on the outside of the vine.

A Warning.

A word of warning is necessary to those growers who have the disease known as woodiness in their plantation. This disease, characterised by the production of small, hard, and usually deformed fruit and a mottled and crinkled condition of the foliage, has recently been shown by Noble[7] to be a disease of the virus type which may be transmitted from a healthy to a diseased vine by mechanical means, such as possibly the pruning knife or even the hand.

Careful examinations of the plantation should therefore be made towards the end of the winter, when woodiness will be showing up, and any plants exhibiting symptoms of this disease should be cut off at the base so that the vine will have died and dried out before pruning time. Should a plant that has been missed be met with when pruning, the knife and hands if used on a diseased vine should be washed well in methylated spirits or soapy water before passing on to a healthy plant.

Recommendations.

Based on the results of the experimental work the following recommendations are now made for the control of brown spot of the passion vine:—

(1) Train the passion vines in a systematic manner right from the start, making sure that the main runners are kept well tied to their respective wires, as this facilitates subsequent pruning.

(2) Prune back laterals at least once a year either before the flowers for the summer crop have formed if a summer crop is desired, or later if the intermediate and winter crop is most favoured. A further trimming may be necessary after the vines have begun to shoot.

(3) Follow the pruning with a Bordeaux spray of 6:4:40 or 4:4:40 strength. This spraying should be repeated once a month until the end of January, and then once every six weeks or two months until next pruning time. When mature fruit are on the vine ammoniacal copper carbonate may be substituted for the Bordeaux. During the cool months special attention needs to be given to young shoots and fruit for the control of powdery spot and scab which is prevalent at that time.

For the first eighteen months most attention should be paid to training the young vine, spraying, except during the winter for powdery leaf spot, being not always necessary.

Summary.

The most serious disease of the passion vine in Queensland and a limiting factor in its cultivation is brown spot. This disease is responsible for a leaf spot, stem cincturing, and fruit spot, and its presence may ultimately result in the complete dying back of the vine.

Brown spot is shown to be caused by a species of *Macrosporium*, spore measurements and cultural characters of which are given.

The temperature reactions of the organism and the seasonal development of the disease are discussed.

Other species of *Passiflora*, including *P. quadrangularis* and *P. alba*, are shown to be subject to attack by the same disease.

Field experiments are briefly described whereby it has been shown that brown spot may be effectively controlled by systematic pruning and spraying. The value of pruning is discussed in some detail.

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CAMP FOR MEMBERS OF HOME PROJECT CLUBS.

IPSWICH SHOW, MAY, 1931.

The Ipswich Pastoral and Agricultural Society has requested the Department of Public Instruction to select fifteen boys from among the members of Home Project Clubs to attend a camp at the Ipswich Show in May next, as guests of the Show Society.

Nominations will be considered from schools on or near the following railway lines:—

Ipswich to Yarraman;

Ipswich to Murphy's Creek;

Ipswich to Dugandan and Mount Edwards; and

Ipswich to Marburg.

Schools which have completed their organisation of clubs on or after 1st September, 1930, may nominate members desirous of attending the camp. Other schools which desire to be represented should commence their club work not later than 7th February, 1931, and should furnish to the Department of Public Instruction by that date particulars of the membership of the clubs operating.

The Departmental Organiser will visit the various centres for the purpose of valuing the work of the club members, and the selection will be made on the comparative merit of the work done by the members.

These agricultural project clubs have a definite educational, as well as an economic value, and parents are urged to co-operate with the head teachers of the various schools in establishing club work in their districts.

CATERPILLAR CONTROL.

Some few weeks ago an armyworm outbreak was reported from the Darling Downs. Although the reports indicated damage of a serious nature to wheat and other crops, an investigation showed that the outbreak was localised and that the total damage was of a minor nature. However, in view of the possibility of future outbreaks the following standard control measures, drawn up by Mr. J. A. Weddell, Assistant Entomologist, should be of interest.

The standard control measures recommended to cope with an armyworm outbreak—measures that should be applicable in this instance, consist of the following:—

Where the extent of a local infestation is fairly clearly defined and there is danger of further spread of the caterpillars into neighbouring and relatively clean areas, the spread may be prevented by means of furrows dug either around the infested area or, if the caterpillars are on the move, at right angles to the main direction of the advance. The furrows should be dug, having the side next to the area to be protected as steep as possible. At intervals along the bottom of the furrow, holes should be sunk. As an extra precaution, a bait consisting of poisoned bran should be sprinkled along the furrow. The poisoned bran may be made up as follows:—

Bran	25 lb.
Paris green	1 lb.
Molasses	1 quart
Oranges	2 fruits
Water	2 gallons (about)

The Paris green and bran should, first of all, be mixed together in a thorough manner and while still dry. The molasses and the finely chopped fruit and its juice should then be added to some of the water. The water containing the molasses should next be mixed with the bran and Paris green and the whole should then be well stirred up, enough water being added to produce the right consistency.

It is highly desirable that the poison bait should be of the right consistency, and only sufficient water should be added to permit of its being in a crumbly state and thus capable of being easily scattered broadcast on the ground. It should, at the same time, be sufficiently moist to permit of each flake of bran taking up its quota of Paris green and molasses.

Neither the fruit juice nor the molasses is essential in this bait, although they are usually considered desirable.

Poultry and other domestic animals should not have access to areas that have been treated with poison bran baits.

The value of the furrow lies in the fact that the crawling caterpillars will usually follow the line of least resistance, and that once they fall in to the furrow they will move along its length rather than climb the steep side. They thus find and feed on the poisoned bran, and ultimately gather in the prepared holes where they die or may be conveniently killed and buried.

The sprinkling of the poisoned baits is of value within the area actually infested. The material mixed as described should be broadcast loosely into the foliage; some of it then remains in the foliage and the rest trickles to the ground, but in either situation it is readily accessible and acceptable to the caterpillars. The quantity mentioned above is usually considered sufficient for about half an acre when scattered broadcast.

Where a portion of the crop is already a total ruin and it is desired to kill the caterpillars, more especially to prevent further spread, the foliage may be sprayed with arsenate of lead, made up at the rate of 1½ lb. lead arsenate powder to 50 gallons of water. In this case, however, the grain crop will be dangerous as food for both man and beast, and this method must not be applied unless the owner is prepared later to destroy by burning the area so treated.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART III.

This is the third article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising on comparatively small holdings.

SELECTION OF BREEDS.

THE breed type most suitable to local conditions should be selected, for types as we know them have been evolved under special and selected conditions. The greater area of our merino country is suitable to the medium to strong types of that breed.

Very few flocks of the fine-woolled types are now bred, the medium and strong types being more generally raised. As they advance in age their wool "fines down" and most of our fine fleeces are produced by these older sheep. Usually the sheep are bred on the holding, therefore the most suitable breed and type is of first

Plate 186.—Sheep Watering at a Dam, Stamford, Hughenden District.

consideration. Many owners are satisfied to go on without culling, but as an inferior sheep eats as much as a good one it is sound policy to class the flock carefully, and endeavour to raise the standard to as high a level as possible under existing conditions.

Culling.

The proper time to cull is just before or during shearing, whichever is found more convenient. The average sheep farmer, who has ewes of a fair standard and of the type suitable to his conditions, can, with careful judgment, class his own flock. By introducing a suitable ram to mate with the best of the ewes, a start may be made to improve the flock.

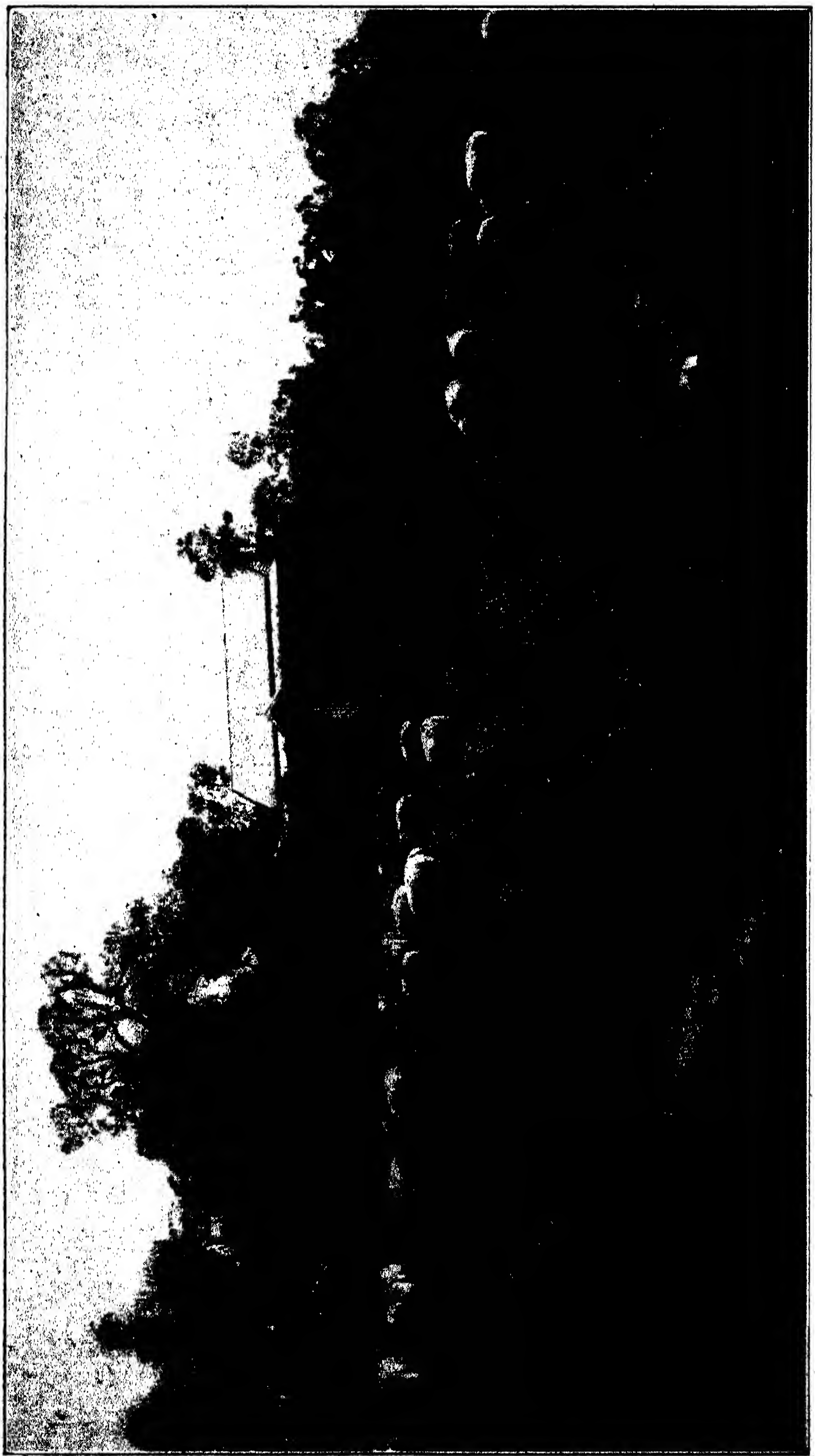

PLATE 187.—A FARMER'S FLOCK AT COALSTOUN LAKES, NEAR BIGGENDEN, BURNETT DISTRICT.

By a sound system of culling, when a holding is fairly well stocked up, big losses may be averted. Firstly, all nondescript ewes should be fattened and sold.

The old breeding ewes, if culled for teeth defects, may be fattened before they become broken-mouthed, otherwise it is impossible to improve their condition. On large holdings sheep classing forms part of the yearly operations, and what is profitable to the large flock-owner may also apply to the small one.

Not only is it more profitable, but it gives a greater amount of satisfaction to possess a good flock, which should be the owner's pride. At the first the standard may not be high, but any sheep farmer who takes a proper pride in his flock will soon form his own standard of excellence. To achieve this, the first culling will be the number that can be spared economically.

A thorough inspection of each sheep as it is shorn, when all defects in the fleece are revealed, will soon convince the owner that the matter of culling is simple but very important. As the flock increases in numbers the percentage of culls may be greater until the standard aimed at is reached.

The chief aim should be to retain all full-sized, vigorous sheep according to type, possessing a well-proportioned body and showing a robust constitution, carrying a full, even fleece of good colour, and true to type.

Merino Types.

A fine merino should have a covering of fine dense wool, with spinning counts of 70s to 70s supers as a 4-tooth. They are more suitable to the cooler parts of the State, but if exposed to hard, dry conditions their wool is more subject to deterioration than the stronger types.

The medium type of sheep should be bigger bodied and more robust than the fine. They will be found suitable to the greater extent of our sheep country, and should produce a wool varying in spinning counts from 64s to 70s. They are a very desirable type and retain their chief characteristics to a great degree. As they grow older their wool is less robust; it "fines down," and if well grown, as in normal seasons, will be found to possess a good length of staple of a desirable character.

The strong-woolled type of sheep are large, plain-bodied animals, more robust in every respect, with a deep-grown covering that resists dust to a greater extent, and will not deteriorate to the same degree under the trying conditions met with on the exposed western plains. To be a true, strong wool type they should produce a characteristic merino wool of 60s to 64s spinning counts in ewes and 60s to 58s in rams, but in each case they should possess a liberal length of staple.

To be a thoroughly efficient sheep classer it is necessary to be able to recognise the different types and qualities of merino wools as well as to discriminate between the types of sheep, when all circumstances likely to affect both sheep and wool must be taken into consideration.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
Allora: 18th and 19th February.
Killarney: 27th and 28th February.
Milmerran: 3rd March.
Pittsworth: 5th March.
Warwick: 10th to 13th March.
Toowoomba: 23rd to 26th March.
Oakey: 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Taroom: 4th to 6th May.
Boonah: 6th and 7th May.
Murgon: 8th and 9th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Cleveland: 10th and 11th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

AUSTRALIAN TRADE WITH THE EAST—II.

By COLONEL D. E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Colonel Evans, who is well known in professional and commercial circles in Brisbane, were made in the course of a recent visit to Japan, Korea, Manchuria, and China, and will be read with much interest by all concerned with the expansion of Australian trade in the countries of Eastern Asia, especially in relation to our primary products. The first instalment of this series was published in the November Journal.—Ed.

MANCHURIA is situated in the north-eastern extremity of China. Parts of Russian Siberia and Japanese Korea form its own north-eastern boundary. Its area, covering about 382,000 square miles, is almost the same as that of Egypt, or the aggregate area of Texas and New Mexico in the United States; it is almost half the size of Mexico, or more than three times the size of Japan proper; it is larger than New South Wales, about four times the size of Victoria, and rather more than half the area of Queensland. Its population is estimated variously at from 23,000,000 to 27,500,000, and it is now increasing rapidly through constant migration from China proper.

PLATE 188.—PLOUGHING A SOYA BEAN FIELD.

Contrasted with other parts of China, its natural resources are rich, especially in agricultural, mineral, and forestry products. Its economic possibilities attracted the attention of neighbouring nations, but it was not until after the Russo-Japanese war in 1904-5 that it became more or less a land of opportunity for the world generally. The waters of the Yellow Sea and Gulf of Pechihli wash its southern shores.

Two large mountain ranges—the Khingans, Great and Little, and the Changpai —traverse its territory from north to south.

The valleys are extensive and generally fertile, while the mountainous regions are rich in timber and minerals. The country also possesses the advantage of large navigable rivers, among the chief of which are the Amur, Sungari, Yalu, and Liao. Though frozen in winter, each of these waterways during other seasons carries a large commercial traffic.

Although the indigenous native is the Manchu, 90 per cent. of the present population are Chinese.

The country has a most interesting historical background which, to those so inclined, would repay earnest study.

There are about 3,400 miles of railway in operation, mainly financed by foreign (principally Japanese) capital.

Plate 189.—A Soya Bean Field in Manchuria.

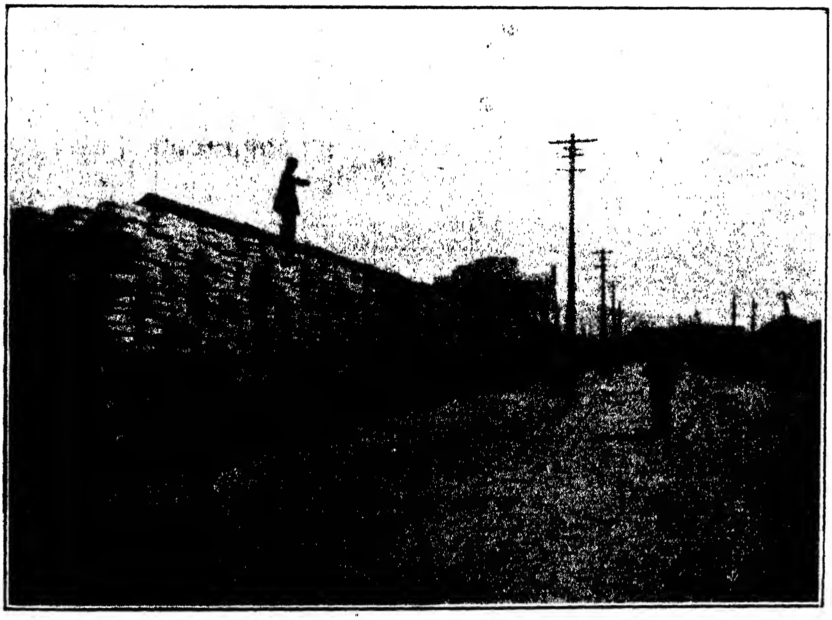

Plate 190.—Train Load of Soya Bean Cakes brought to Mixed Storage at Dairen.

Trade.

In the commercial history of Manchuria, the growth of Dairen as a world port, and the creation of a great export trade in beans, are the most significant features. Agricultural produce remains the principal item in outward manifests. Soya beans and their products (bean cake and bean oil) to-day command the world's markets. For many years these products constituted more than half the total exports of Manchuria. Millet, wheat, maize, and barley are also important exports. Imports are made up mainly of steel, machinery, cotton yarns and fabrics, mineral oils, and woollen goods.

Agriculture in Manchuria.

Manchuria has been described as the "granary of Asia," as possessing "one of the richest soils in the world," or as "the land of opportunity." Its agricultural possibilities were not realised generally until railway development was extended along the Liao Valley after the Russo-Japanese war. To-day the country is supplying a large proportion of the requirements of Japan in foodstuffs and raw materials for industrial purposes.

The principal cultivated crops are the world-known and valued soya bean and kaoliang, the staple food of the native.

PLATE 191.—PLANTING THE SOYA BEANS.

Besides those already mentioned, other products include hemp, flax, ramie, tobacco, rice, cotton, and silk. Of live stock, cattle, horses, donkeys, mules, sheep, and pigs are important. Lack of reliable statistics makes it difficult to state quantities of production.

Kaoliang or sorghum, being not only the staple food of the native population, but the principal grain food of numerous animals engaged in farm work, the major portion of the cultivated land of Manchuria has for centuries been cropped with this grain, and its production surpassed even the bean. Bean cultivation has gradually extended, however, as the world's markets strengthened their insistent demand.

Soya Beans.

The story of the Manchurian bean is one of the most interesting romances in economic history. The Japanese found some compensations for their heavy expenditure in the Chino-Japanese war in the mid-nineties in the discovery of the Manchurian bean, which revolutionised the fertiliser industry and became a substitute in the Japanese rice field for the dry herring fertiliser then extensively used. Ever since Japan has been the heaviest purchaser of the soya bean.

The first foreign trial shipment was sent from Dairen to Liverpool in 1908, and this was the beginning of a new industry in England, Germany, Denmark, and Holland. Germany's consumption subsequently became greater than all. At the time of the universal shortage of food during the European war, the Manchurian bean was a very important factor in the world's food supply.

Plate 192.—Soya Bean Graded at Mixed Storage at Dairen awaiting Shipment.

Plate 193.—Soya Beans being unloaded at the Railway Yard of Changchun Station.

The demand for this bean is ever increasing. Beans and bean cake imported by Japan, as foodstuff or fertiliser, are to-day helping in the solution of the national food problem.

The influence of the Manchurian bean on national economy is remarkable. Denmark was self-supporting in the production of cereals, especially wheat, until about thirty years ago; but through American large-scale production, Danish products were unable to compete successfully, even in the home market. Aided by the Manchurian bean, the Danes turned to extensive and intensive stock breeding. The bean is imported, the oil extracted and used for making margarine, soap, &c., while the residue is used extensively as stock food. Holland, to some extent, follows the same practice.

To climate and soil are ascribed the high quality and quantity production of the soya bean in Manchuria. The average yield is 20 bushels an acre in Manchuria, while it is 18 bushels in Japan, 18 in the United States, 13 in Korea, and 14 in China. Manchurian production amounts to more than half of the world's output from this crop. While bean production is increasing every year in Manchuria, it is at a standstill, more or less, in other countries.

PLATE 194.—EXPERIMENTAL TOBACCO PLANTATION AT FENGHUAGCHENG MODEL FARM.

The reason why the Manchurian bean commands world-wide popularity is the actual value of this staple food for man and beast, fertiliser, and as raw material in various chemical industries. It is said to contain a higher protein content than the product of other countries. Whether that is so or not, it is hard to say, but there is certainly no reason why that claim should not be tested in Queensland. The constituents would vary, of course, more or less according to locality, variety, and season.

Manchurian beans are divided into four classes according to colour—yellow, white, green, and black. The chemical composition of these beans, according to analyses made in 1927 by the Central Laboratory at Dairen, is as follows:—

—	Moisture.	Crude Fat.	Crude Protein.	Crude Fibre.	Nitrogen Free Extract.	Crude Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Yellow	11·06	18·19	39·94	5·20	21·41	4·30
Black	11·96	14·74	41·00	5·34	23·01	4·20
Green	8·13	18·96	40·12	5·45	22·54	4·80

[TO BE CONTINUED.]

A POULTRY MITE INFESTING DWELLINGS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

Within the past two months instances of a poultry mite infesting houses and attacking man have been brought under the notice of this Department. Inquiries usually state that starling lice are the causal agents, but in the cases under consideration a species of poultry mite was found to be the cause of the discomfort to the inmates of the dwellings concerned.

The mite in question is known as the Tropical Poultry Mite, *Liponyssus bursa* Berlese, and, as the popular name implies, it is usually found on the domestic fowl, causing great discomfort at times to the nesting hen, and capable, if unchecked, of bringing about fatal results among the newly hatched chickens. This tiny parasite, like all mites, possesses four pairs of legs and is usually reddish in colour, the colour being caused by the ingested blood. In size it rarely reaches beyond .7 mm. or about 1/30 inch—i.e., not as big as a pin's head. The blood is sucked in through a tubular apparatus, part of which is the long chelate stylets which pierce the skin of the host.

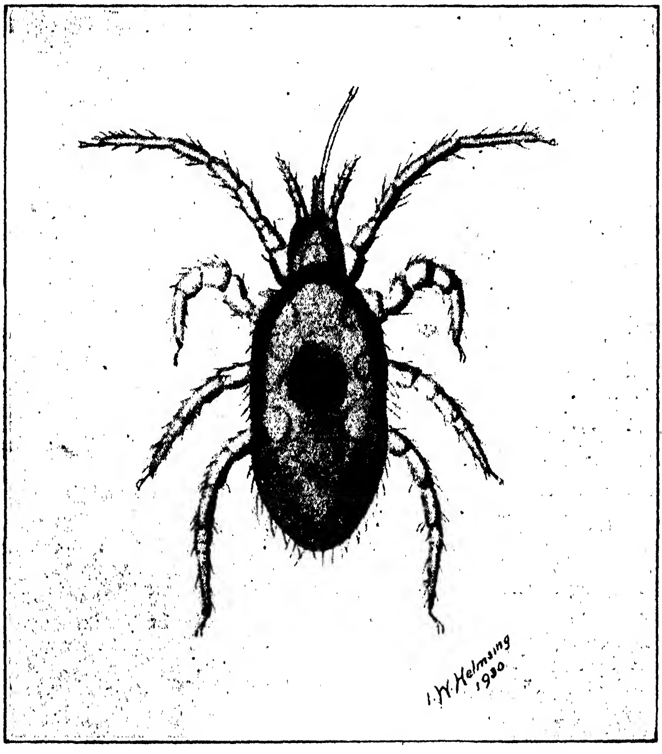

Plate 195.

The Tropical Fowl Mite, *Liponyssus bursa* Berlese.

These mites usually infest the nests and surroundings, attacking the birds only when food is required. The tiny egg is laid away from the host and in a short time hatches out into a larva which differs from the adult by possessing three pairs of legs instead of four. After the first moult or shedding of the skin four pairs of legs appear, and following one to three further moults the adult form is reached.

Besides the domestic fowl, *Liponyssus bursa* has been found on the domestic pigeon and common sparrow, and is probably conveyed from one locality to another mainly by these hosts. Both pigeons and sparrows nest in dwellings, and if these mites are present they will remain with the birds so long as the birds frequent the nest. Once nesting is finished and their hosts are fled, numbers of the parasites descend into the dwellings and attack any animal, including, of course, man, with

which they come into contact. In the cases cited, infestation of the dwellings was traced to pigeons which had vacated their nests, leaving the mites to starve. Fortunately, although their attack brings about acute discomfort to the inmates, they are able to live only about ten days away from their warmer-blooded hosts, and also appear incapable of breeding. As a rule, therefore, unless the building houses a large number of birds, the parasites do not last longer than about ten days.

Numerous other species of mites, other poultry mites, and rat mites have been recorded as attacking man, their infestations causing general, intense, and continuous pruritus or itching. The irritation may disappear within a few days, but if friction is resorted to as a relief an ulcerous condition may be set up.

As a first measure in the eradication of such parasites the nests of the birds—pigeon or sparrow—should be located and removed. The premises should then be thoroughly sprayed with a carbolic solution or some other efficient insecticide, such as a pyrethrum-containing solution, of which several proprietary mixtures are on the market.

For the treatment of the bites, the Health Department recommends the bathing of the affected areas with a weak carbolic acid solution—1 in 40 would do—and the application of the following ointment:—β/ Naphthol, 15; lard, 100; green soap, 50; lanoline, 10.

THE CARE OF THE CAR.

Every year sees the motor car improved; sometimes the improvement is an important step and sometimes only a refinement, but it is safe to say that in the motoring world at least the motto "Every day in every way we get better and better," is lived up to.

Looking back over the past decade, we see remarkably rapid changes in motor-car construction. After the war the heavy four-cylinder car dominated the motor market. The engine was usually lacking in acceleration, and riding comfort did not exist as compared with the modern car. About 1920 the more flexible six-cylinder engine began to gain in popularity, or rather car builders began to turn out six-cylinder cars at a reasonable figure. The year 1924 saw four-wheel brakes introduced on numerous models, and 1925 saw the balloon tyre gain its popularity.

To-day two major improvements in the transmission system are engaging the minds of keen motorists. They are the silent gears and the free wheel.

The transmission system of the average car has always been one of its weaknesses. The skill required in effecting gear changing has frightened many a would-be motorist, and is a worry to many experienced drivers, also the noise made by most cars when running in the intermediate gears has been unpleasant, to say the least.

Difficulties in gear-changing, together with noise in gears, have made the "go-anywhere-in-top" car popular, although such cars consume much more petrol than the car that requires gear-changing.

The Silent Gear.

When the usual type of gear is used its silence in operation depends chiefly upon two factors—its accuracy of machining and its size compared with the amount of work it does. High-grade cars fitted very large gears and had them ground so perfectly that the noise in gear was not very pronounced. However, in a light car the gear must necessarily be light, and because of the vibration set up as the strain is transferred suddenly from one tooth to the next the gears tended to whine. The obvious way out of the difficulty was to use gears so arranged that each tooth took up its load gradually. So-called helical gears do this because the teeth are cut on a bias across the face of the gear wheel. It is obvious, however, that helical gears are not suitable for sliding into mesh, as is done in the usual type of gear box. Therefore ingenious gear boxes were designed in which the next gear to top (third in a four-speed box, second in a three-speed box) was permanently in mesh and the drive was actually engaged by means of dogs on the main shaft. Another form of silent gear was obtained by using an internal gear—that is, a pinion meshing with gear teeth on the inside of a ring. When this method is used, instead of one tooth taking all the load at any instant, the load is shared among several teeth so that the operation is comparatively silent.

The introduction of silent gears changed the outlook of many manufacturers in the matter of top-gear performance, so that cars that until recently were fitted with three gears now have four forward speeds, the silent third gear being used for work in traffic or for hill climbing, whereas the top gear is used for high-speed driving on the other road.

The Free Wheel.

For many years motorists have discussed the possibilities of using a free-wheel attachment on the motor car, and for the last three years it has been possible to have a free wheel fitted to many European cars as an extra. However, this year the free wheel has been standardised on a very popular American car, so that it may be said that the free-wheel fashion is established.

The free wheel is essentially a device in the transmission which allows the car to over-run the engine without speeding the engine up. Motorists who have ridden an ordinary bicycle will appreciate how the free wheel acts.

The free-wheel device is usually placed just behind the gear box, so that immediately the throttle is released the engine and gear box will slow down to idling speed, but the car will coast along just as if it were in neutral. When the engine is again accelerated the drive will be taken up by the engine immediately the engine reaches the speed that corresponds to the speed of the car.

The free wheels used on motor cars are not fitted with ratchet devices, but are usually an arrangement not unlike a roller bearing, which runs freely when rotated one way but which jams when rotated the other way.

Gear Changing on a Free-wheel Car.

The addition of the free wheel to a car makes gear-changing simplicity itself, because it is no longer necessary to judge the speeds of the two gears to be meshed. Immediately the clutch is depressed the jack shaft to the gear box is released and comes to rest, whereas the free-wheel device frees the main shaft in the gear box and it also comes to rest, so that the changing of gears is actually effected in a gear box in which the pinions are not revolving. In fact, the gears are usually changed without touching the clutch, because immediately the accelerator is released the free-wheel device operates, and the engine and gear box slow down to idling speed; since the gears have no load upon them it is possible to change gear with the clutch still engaged without the slightest clashing of gears.

The free-wheel device results in a marked economy in the petrol consumption, because the engine merely idles when it is not required. With the ordinary fixed-drive car, the engine acts as a brake when the throttle is closed, so that often the car is being braked unnecessarily. Also when the engine is being driven by the back wheels considerably more fuel is sucked through the carburetter than is the case when the engine is merely idling. The economy in fuel is estimated to be approximately 15 per cent.

The economy in lubricating oil is also very marked, because it is when the car is driving the engine that oil is sucked into the combustion chamber and wasted. Lastly, the life of the engine is increased, because when the free wheel operates the engine revolves slowly, and as a consequence the number of revolutions of the engine for any given trip is reduced enormously. The life of an engine, provided it is properly cared for, depends upon the number of revolutions it makes.

The writer has heard the objection raised to the free wheel that it prevents the engine being used as a brake, which is essential when descending long steep hills. However, all free-wheeling devices are provided with a means of locking the free wheel so that the objection raised has no significance.—"Radiator" in the "Farmer and Settler."

A HELPFUL JOURNAL.

A Toowoomba farmer, renewing his registration, writes (12th November, 1930): "I have found the Journal very helpful."

A Nanango farmer writes, 10 November, 1920: " . . . I appreciate the Journal very much."

CITRUS FRUITS.

FIELD TRIALS IN SOUTHERN AND CENTRAL QUEENSLAND.

The Director of Fruit Culture, Mr. George Williams, has received the following progress report from Mr. R. L. Prest, Instructor in Fruit Culture, on field trials of citrus fruits in Southern and Central Queensland:—

IN Central and Southern Queensland, co-operative field trials in citrus culture have been conducted by the Fruit Branch during the years 1928 to 1930.

Many of the recommendations and conclusions which follow are in harmony with, and have been set forth as a result of, similar investigations elsewhere.

It was realised at the outset that the problems to be studied, such as low production and lack of vitality of citrus trees were in evidence in all centres, hence the field trials were located on the heavier red volcanic soil and sandy alluvial soil. Many observations made in orchards on other soils have added to the information gained.

No. 1 orchard for field trial is located at Mapleton on the property of the Mapleton Farm College. The trees were twenty-five-year Valencia Late and Washington Navels, and were in a decayed and unproductive condition when the trials commenced.

No. 2 orchard is located on the property of Mr. R. A. Ulcoq, Gayndah, Central Burnett district. There the trees were fifteen-year-old Beauty of Glen Retreat mandarins which were weakly, mottling, with a considerable amount of dead twigs and terminal branches.

No. 3 orchard is located on Mr. V. G. Pack's property at Montville. The trees included twelve-year old Valencia Late, Sabina, and Scarlet and Fewtrel Early oranges and mandarins. Although apparently healthy the trees appeared hide-bound and were not growing freely and bore unsatisfactory crops.

No. 4 orchard is located at Inglenook, Palmwoods. The trees there were six-year-old Valencia Late and two-year-old Beauty of Glen Retreat mandarins. The former were very unthrifty trees.

Fertilisation.

The red volcanic soils are commonly relatively rich; citrus trees on these soils respond to proper fertilisation, as also do those on the deep, well-drained, sandy alluvial soils. On plots Nos. 1 and 3 essentially similar materials were used, but as trees were of greater age larger quantities were applied on No. 1. Plot No. 2 on sandy soil received a slightly different fertiliser.

All plots were dressed with agricultural lime at the rate of one ton to the acre.

		Per tree. lb.
Plot No. 1.—	Nitrogen	2.4
	Phosphoric acid	2.5
	Potash	1.9
No. 1A.—	Nitrogen	3.0
Plot No. 2.—	Nitrogen	1.3
	Phosphoric acid	1.4
	Potash	1.4
No. 2A.—	Nitrogen	1.9
Plot No. 3.—	Nitrogen	1.2
	Phosphoric acid	1.6
	Potash	1.4

Materials used were sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The applications were made twice a year in August and March.

Irrigation.

Plots Nos. 1 and 3 were under natural rainfall, being in the coastal belt. No. 2 received light irrigation; the supply failed, but was re-established in July, 1929.

Cultivation.

During the drier months constant cultivation was carried out until towards the end of October, when a green cover crop of cowpea or bean was planted, to be ploughed under in March-April as weather conditions permitted.

Table I. shows the average tree production prior to 1928, the average tree production for 1928, 1929, and 1930, and the two years' average for 1929 to 1930.

The 1928 crop was generally heavy throughout the State. The trials commenced in the late spring of 1928.

COMMENTS ON YIELDS AND TREATMENT.

Weather, of course, influences greatly any crop grown in the open air. The dry spring and winter of the 1928-29 season had a serious effect on the crop which was exceptionally light throughout the State, the December drop being particularly heavy.

In spite of adverse weather conditions, there was marked improvement from the commencement. The trees increased their vigour, foliage improved, fruiting wood was increased and satisfactorily matured, and a good crop produced.

The fruit was well distributed over the trees, even in size, of good quality, bright, and markedly freer from disease.

With the more favourable growing conditions experienced in 1930 results were even more gratifying. In the coastal belt heavy wastage was experienced during the harvesting of the crop. The figures quoted in Table I. are for cases marketed; wastage is not included.

Though nitrogen appeared to be the most important element required, results indicated the necessity for balancing the food supplies. The three elements generally most rapidly depleted in the soil being nitrogen, phosphoric acid, and potash, were replaced by the addition of sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The quantities used must in no way be considered correct for all conditions; they are, however, a guide for any similar set of conditions frequently met with.

In making available the plant nutrients added in the fertiliser, consideration of soil conditions was a most important factor. The absence of adequate supplies of farmyard manure necessitated green crop practice. The summer rains were made use of to grow a leguminous cover crop, which also assisted to prevent soil erosion, as well as taking up extremely soluble plant nutrients preventing them from being lost in the drainage water.

The carbon, oxygen, and hydrogen of plants come largely from air and water and the ploughing under of green plant crops, therefore increase the store of such constituents in the soil. The compounds that result from such crop decay increase the absorptive power of the soil and promote aeration, drainage, and granulation. If the crop turned under is a legume and the nodule organisms are active, the store of soil nitrogen is augmented.

Again added organic material acts as a food for soil organisms, and tends to stimulate biological changes to a marked degree. This biological action is especially important in the production of carbon dioxide, ammonia nitrates, and organic compounds of various kinds which are necessary for plant nutrition.

Nitrogen appears to be the most important element required—not only is it absolutely necessary for the plant's growth, its stimulation of the vegetative parts, and its close relationship to the general tone of the fruit, but also it was not one of the original elements of the earth's crust. During the formation of the soil it slowly and gradually became present through being brought down by rains and fixed naturally through the agency of bacterial acitvity. It now exists in nitrogenous compounds of the more or less decayed organic matter.

One of the possible limiting factors to the crop growth is the lack of water-soluble nitrogen at critical periods in quantities necessary for normal growth. It is the only one of the three common fertiliser elements; when added in excess will result in harmful after effects on the crop. It may delay maturity, lower the quality, and decrease resistance to disease.

Phosphoric acid hastens the maturity of the crop by its ripening influences, and also encourages root development, especially the lateral and fibrous rootlets. Excessive quantities of phosphoric acid ordinarily have no bad effect, for phosphorus does not stimulate any part unduly, nor does it lead to a development which is detrimental. Phosphorus is a balancing power on the unfavourable influences generated by the presence of an undue quantity of nitrogen.

The presence of plenty of available potash in the soil has much to do with the tone and vigour of the plant. By increasing resistance to certain diseases it tends to counteract the ill effects of too much nitrogen, while in delaying maturity it works against the ripening influences of phosphoric acid. In a general way, it exerts a

43

balancing effect on both nitrogen and phosphate materials, and consequently is important in a mixed fertiliser, if the potash of the soil is lacking or unavailable.

At the commencement of the trials the fertiliser was applied in two dressings, August and March. Later this was altered to three applications a year, and in the case of plot No. 2, four were applied; the smaller and more numerous dressings are recommended. A more even supply of plant nutrients is assured and any losses by leaching are greatly minimised.

TABLE I.

—	——	Plot No.	Average before Trials.	Average for 1928.	AVERAGE DURING FERTILISER TRIALS. 1929.	AVERAGE DURING FERTILISER TRIALS. 1930.	Average for Two years.	Increase Average
			Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
I.	Agricultural lime, 1 ton per acre; Sulphate of ammonia, 12 lb. per tree; Nauru phosphates, 14 lb. per tree; Sulphate of potash, 4 lb. per tree	I.	1½	2	2	8	5·0	3·5
	Sulphate of ammonia, 15 lb. per tree	IA	1½	2	2	7	4·5	3·0
II.	Gypsium, 1 ton per acre; Sulphate of ammonia, 4 lb. per tree; Dried blood, 4 lb. per tree; Nauru phosphates, 8 lb. per tree; Sulphate of potash, 3 lb. per tree	II.	1½	2	3	8	5·5	4·0
	Dried blood, 16 lb. per tree ..	IIA.	1½	2	2½	6	4·25	2·75
III.	Agricultural lime, 1 ton per acre; Sulphate of ammonia, 6 lb. per tree; Nauru phosphates, 9 lb. per tree; Sulphate of potash, 3 lb. per tree	III.	2	4	3	7	5·0	3·0

TABLE II.

Plot.	Number.	Cost of Fertiliser.	Average Net Return.	Average Increase in Returns (net).
		s. d.	s. d.	s. d.
I.	I.	4 6 per tree	5 0 per case	17 6 per tree
	IA.	4 6 per tree	5 0 per case	15 0 per tree
II.	II.	3 0 per tree	9 0 per case	36 0 per tree
	IIA.	3 0 per tree	9 0 per case	24 9 per tree
III.	III.	3 0 per tree	5 0 per case	15 0 per tree

The Young Farmer.

NOTES ON MILK AND CREAM TESTING—I.

By OFFICERS OF THE DAIRY BRANCH.

THE following notes are intended to assist students in preparing for their theoretical examination for the milk and cream testing certificate, conducted by the Department of Agriculture and Stock in July each year.

These notes are not intended as a substitute for a text-book, but as a supplementary thereto, and students are advised to procure a standard work on the subject. They should obtain as much practical experience in testing as possible, for in the practical examination ease of manipulation is of paramount importance.

Under the regulations governing the issue of milk and cream testing certificates the following subjects are scheduled:—

(1) Elementary knowledge of the secretion of milk and factors which influence the same.

(2) The composition of milk and cream and factors which induce variation therein.

(3) Estimating by the Babcock method the quantity of butter fat in milk and cream from weight and volume of samples.

(4) Errors which may occur in testing, and how to correct or avoid same.

(5) Estimating solids in milk.

(6) The collection of samples, and means of preserving same.

(7) Recording and computing results of testing.

(8) Methods of testing for acidity, moisture, and preservatives.

(9) The over-run, and factors which influence it.

(10) The legislative measures in the various States.

Text-books recommended: Van Slyke or Farrington and Woll.

Composition of Milk.

The principal constitutents of milk may be classified into—

(1) Water of which normal milk contains approximately 87.1 per cent.

(2) Fat of which normal milk contains approximately 3.9 per cent.

(3) Proteins (casein and albumin) of which normal milk contains approximately 3.2 per cent.

(4) Milk sugar of which normal milk contains approximately 5.1 per cent.

(5) Mineral salts or ash of which normal milk contains approximately .7 per cent.

"*The Dairy Produce Act of* 1920" prescribes that milk shall contain not less than 3.3 per cent. of fat and not less than 8 per cent. of milk solids (not fat).

Water.

The quantity of water normally contained in milk varies at individual milkings and is influenced by certain conditions, such as individuality of the cow, breed, stage of lactation, age, character of food, amount of water drunk, and state of health.

Fat.

Milk-fat is generally called butter-fat, and is a variable mixture of several different compounds called glycerides. Each glyceride is formed by the chemical union of glycerine with some particular acid. There are about ten different acids found in milk-fat, but some are present in small proportions. The principal acids are palmitic, oleic, myristic, butyric and stearic. The compounds formed by each of these acids with glycerine are termed palmitin (i.e., glycerine combined with palmitic acid), olein, myristin, butyrin, and stearin.

Fat Globules in Milk.

The fat exists in milk in the form of exceedingly minute globules. In one drop of milk there may be about 100,000,000 of these fat globules. The size and number of these globules vary in the milk of the different breeds of cows and are also influenced by the stage of lactation, food, health, and age, while they vary in number at different milkings or at different parts of the same milking.

The quantity (or percentage) of fat in milk may be influenced by—

1. *Individuality of cow.*—It is uncommon to find two animals in a herd whose milk contains the same percentage of fat.

2. *Breed of cow.*—The percentage of fat in milk varies in a somewhat characteristic way with the kind of breed of cow. While individual cows vary in test in the same breed there is usually a fairly uniform difference; and if we consider averages we find that they also vary in the different breeds.

3. *Advance of lactation.*—As the stage of lactation advances and the flow of milk diminishes the fat percentages increases after about the third month, although, of course. the actual quantity of fat produced at each milking is less.

4. *Variation of time between milkings.*—As a rule the longer the time between two successive milkings the smaller is the percentage of fat in the milk.

5. *Fat variation.*—The first milk drawn at a milking contains the least fat while the milk last drawn (strippings) is the richest in fat.

6. *Other influences*—External or internal influences, such as climatic conditions, treatment, excitement, sickness, &c., also influence the fat content and the quantity of milk.

Proteins.

The number and nature of the proteins in milk is a matter on which dairy scientists differ, but it is generally recognised that there are three or four of them, the chief of which are casein and albumin.

Casein.—Casein is a combination of carbon, hydrogen, oxygen, nitrogen, phosphorus and sulphur.

It exists in milk not in solution, but in the form of extremely minute, solid, gelatinous particles in suspension similar to the fat globules.

Casein coagulates in the form of curd when milk develops acidity and becomes sour or when rennet is added. Heating to boiling point will not coagulate the casein unless a certain acidity is reached.

In milk, casein is combined with calcium to form a lime salt (calcium casein), and in this form is soluble although pure casein is not. This soluble casein gives milk its white, opaque appearance.

Albumin differs from casein in composition and behaviour. It is not coagulated by rennet or by acids, but remains in the whey. It coagulates by heating. It is found in solution in milk.

Milk Sugar.

Milk sugar is also called lactose. It is present in milk in solution. In general composition it resembles ordinary sugar, but is less soluble in water and not so sweet. It is easily converted into lactic acid by certain forms of bacteria. In cheese-making, milk sugar largely passes into the whey.

Mineral Salts or Ash.

The mineral salts of milk are left in the form of ash when milk is evaporated to dryness and incinerated. It consists chiefly of lime, potash, soda, and magnesia.

General Remarks.

In addition to the foregoing, milk contains many other organic compounds in small quantities in addition to certain gases—carbonic acid gas, nitrogen and oxygen.

It will thus be noted that milk contains water, fat, casein, albumin, sugar, salts, and some other constituents in small quantities.

The fat and casein and some of the salts are in suspension, while albumin, sugar, and the larger portion of the salts are held in solution by the water.

[TO BE CONTINUED.]

POINTS IN CALF-REARING.

Always handle calves quietly and patiently, and so develop in the animal a sense of confidence in the human forster-parent which will remain with the calf till it reaches maturity.

Feed at regular times each day and in regular quantities.

Feed only perfectly clean, sweet milk—the calf is not designed to assimilate any other. Add some constituent to replace the feed value of the cream removed from the milk.

Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place.

Cleanse feeding buckets as carefully as you would all other dairy utensils. Cleanse the yards and their surroundings to destroy breeding places of flies, which are active carriers of disease.

Provide shade in summer, and shelter from winter wind and rain. It is cheaper to conserve animal energy in this manner than by the use of larger amounts of food.

Always pick up any pieces of rag, paper, twine, &c., found about the calf paddock. Young calves exhibit a delight in picking up foreign substances of thos nature, and ultimately swallowing them, and indigestible material of this description is almost sure to set up a serious form of gastro-enteritis in young calves.

QUALITY IN CREAM.

The test of the cream has an indirect effect on quality in some instances, and for this reason it is always desirable to run the cream at the proper thickness. For the summer months the test should be between 40 and 42 per cent., while during the colder months it may be reduced to from 36 to 38 per cent. A thin cream, that is, a low testing cream, never has the same keeping quality in hot weather, owing to the increased amount of separated milk present and a greater bacterial action. This should be attended to, as the adjustment of the cream screw is only the matter of a moment.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be indirectly brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Stirring of cream two or three times daily helps to maintain the cream in good physical condition and to liberate any gas which may form. If the cream is left standing for hours before stirring there is a tendency for the heavy portion (casein, &c.), to gradually settle towards the bottom and for the fat to rise to the top, especially if the cream is inclined to be thinly separated. This is not desirable, and stirring will prevent it. A tinned steel or tinned copper stirrer should be used; on no account should a wooden stirrer be employed for this purpose.

It is quite well known that milk from newly calved cows will cause trouble when included in the general supply before it becomes normal, but it is not so generally recognised that some cows when advanced in their milking period will secrete abnormal milk, which will affect the cream and cause it to be graded second quality. This is particularly so when a cow has been milking for a long period, say, twelve months or more, as happens when a cow does not go in calf readily. When this type of cow begins to spring the milk will probably become abnormal, and the cow should be dried off, or the milk fed to the pigs.

Answers to Correspondents.

Liming.

"INQUIRER"—

Liming has passed the experimental stage and is destined to be used extensively on acid soils which exist throughout the State. Liming benefits acid soils by adding to the calcium requirements of the soil and thereby supplying the demands of crops, particularly lucerne, clover, and mixed pasturage. By neutralising acidity and certain poisonous substances found in acid soil, it creates more favourable conditions for the growth and activity of helpful soil bacteria and encourages the growth of the plant roots and renders plant food more available. It improves the texture of the soil and assists in the conservation of moisture. Used in conjunction with commercial fertiliser the returns are improved.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Wild Carrot. Chicory.

W.D. (Goondiwindi).—The three specimens of herbage have been determined as follows:—

No. 1 contained mostly *Apium leptophyllum*, a native plant commonly known as Wild Carrot, not being distinguished from the common Wild Carrot by any distinguishing local name. It is very common in coastal Queensland and the Darling Downs, and I collected specimens at Yelarbon some years ago. Generally speaking, on the Downs it is mostly a weed of cultivation or comes up round stockyards and so forth; in fact, anywhere where the ground has been disturbed. There were a few specimens of the ordinary Wild Carrot *Daucus brachiatus*, mixed with this.

No. 2 was *Daucus brachiatus*, the common Wild Carrot. This belongs to the same genus as the garden carrot. No. 1 to the same genus as the celery.

No. 3 represents *Cichorium Intybus*, the chicory. This plant has been naturalised in parts of the Darling Downs for some years past, and has proved itself a weed in many localities. When it runs wild it loses the large carrot-like tap root for which it is cultivated in certain places as an adulterant of coffee.

Saffron Thistle.

W.R. (Mondure)—

The specimen of thistle is *Kentrophyllum lanatum*, the Saffron Thistle, or Star Thistle, a native of the Mediterranean region that has now found its way as a weed into most of the warm and temperate regions of the world. It is very common in New South Wales and the other Australian States and is found in Queensland, though not so abundantly, we believe, as in the more southern parts of Australia. Some stockowners in South Australia and Victoria have spoken highly of the plant as a fodder in its younger stages, but it soon runs up to a hard stem and becomes quite unpalatable. The plant should be destroyed as far as possible when it first makes its appearance on a property.

Star Thistle.

R.V. (Ipswich)—

The specimen is *Centaurea melitensis*, the Star Thistle, a native of Southern Europe, now a naturalised weed in most warm temperate countries. It is found in various parts of Queensland, but does not seem to be as bad a pest here as it is in some of the Southern States, particularly New South Wales and Victoria. In the former State it is commonly known as "Saucy Jack" or "Wild Irishman," and is one of the worst weed pests they have. It has a certain fodder value when very young, but soon becomes woody and unpalatable. It is an aggressive weed, and should be destroyed when it first makes its appearance on a property.

Sudan Grass.

J.S. (Westbrook, Toowoomba)—

Both specimens represent the true Sudan Grass, *Sorghum sudanense.* Practically all the Sorghums, which include plants very similar in general appearance to the Sudan Grass, such as Johnson Grass and a large African species, *Sorghum verticilliflorum*, known as Wild Sorghum, naturalised in Queensland, contain a prussic acid yielding glucoside, particularly in their younger stages. Used with discretion, however, the plants are undoubtedly very valuable fodders.

Cannas.

H.R. (Cooroy)—

Cannas are not known to be poisonous in any way. One of them, as you probably are aware, is the source of most of the Arrowroot that is prepared in Queensland. The tubers of this particular species (*Canna edulis*) make quite a good food for pigs either raw or cooked. The poisonous principle of young Sorghum is a prussic acid yielding glucoside, and this is not known to occur in Cannas.

Tea Tree.

R.C.B. (Chinchilla)—

The specimen is a species of Tea Tree—*Melaleuca nodosa.*. We were very pleased to get the specimen as the plant is very common on the coast, but yours is the most western so far received. We have had it before, however, from country round Eidsvold and one or two other places in the Burnett district. On the coast the tree usually grows on poor and usually badly drained soil.

Wild Passion Fruit—A Dangerous Plant.

L. L. M. (Malanda, N.Q.)—

The specimen is the Wild Passion Fruit, *Passiflora fœtida*, a tropical American species widely spread over the tropics of the world, and planted as a cover crop in coconut plantations, &c. It is naturalised in most tropical countries, including North Queensland. The ripe fruits are eaten by natives and by children, but nevertheless the plant is a dangerous one, the leaves and green fruits containing a prussic acid yielding glucoside. The plant if eaten in quantity would, therefore, act in the same way as young Sorghum or Sudan Grass, death from eating it being fairly rapid. We should think that, on the whole, stock would have to eat a fair quantity of the plant before any ill-effects became noticeable. The stomach contents forwarded were in rather a decomposed state for examination.

Destruction of Tobacco Bush.

"INQUIRER"—

As the stock are to be allowed to run in the paddock in which the Tobacco Bush is growing, there would be too great a risk to use an arsenical poison. You are advised to try spraying with a 10 per cent. solution of Sodium Chlorate, which is non-poisonous to man or beast. If the bushes are very large and woody, better results will be obtained if they are slashed with a brushhook previous to spraying. Sodium Chlorate may be obtained from A.C.F. and Shirleys Fertilizers, Limited, Brisbane. The price is about 10s. per 14 lb.

Beans.

"INQUIRER" (Port Moresby, Papua)—

The specimen is *Canavallia obtusifolia*, a bean fairly common in Queensland, New Guinea, and the islands of the Pacific. We were very interested in your remarks about its edible qualities, for a friend of ours in the New Hebrides has recently given us the same report. In Queensland we had always looked upon the bean as harmful, though nobody so far as we know had actually tested it. Two species of the same genus are in cultivation, namely *C. gladiata*, the Sword Bean, and *C. ensiformis*, the Jack Bean. This latter is quite a good bean and we think it would be a valuable addition to the vegetables grown in Papua if you have not already got it.

Hexham Scent. Buck Wheat.

R.D. (Purga, via Ipswich)—

The specimen of lucerne-like plant is *Melilotus parviflora*, the Melilot or Hexham Scent, a fairly common weed in Queensland and the Southern States. It was boomed some time ago as a fodder under the name of King Island Melilot, and has a value for growing in light soils where lucerne may not thrive. It is only of annual duration and dies out on the approach of the hot weather.

The other plant with triangular leaves is *Polygonum convolvulus*, the climbing Buck Wheat. It is now and again seen as a weed in Queensland, but is not particularly common. The seeds are a common ingredient of bird seed and chick food.

BUTTER FACTORY PAYMENTS.

A survey of the audited balance-sheets of Co-operative Dairy Associations in Queensland over the financial year 1929-30 indicates that no considerable difference exists in the payments made by the several Associations for their cream supplies.

The following table indicates the average pay by these Associations, and, taking 1s. 3d. per lb. of commercial butter to be the mean average, the amount over or below this figure indicates how closely factories have kept to this average.

In cases where suppliers receive benefits in dividends, deferred pays, or railway freights, such particulars are shown—

	Average Pay.	Above or below 1/3.	Carriage of Cream.
A.	1/4·07 and dividend	+ 1·07	Not paid.
B.	1/3·68	+ 0·68	Railway freight paid.
C.	1/3·54, bonus and dividend	+ 0·54	Not paid.
D.	1/3·53	+ 0·53	Not paid.
E.	1/3·44 and dividend	+ 0·44	Not paid.
F.	1/3·34, deferred pay and bonus	+ 0·33	Not paid.
G.	1/3·24 and dividend	+ 0·24	Not paid.
H.	1/3·04	+ 0·04	Not paid.
I.	1/3·01	+ 0·01	Railway freight paid.
J.	1/2·88 and dividend	— 0·12	All paid.
K.	1/2·76, deferred pay and dividend	— 0.24	Not paid.
L.	1/2·62 and dividend	— 0·38	Not paid.
M.	1/2·55 and dividend	— 0·45	All paid.
N.	1/2·44 and bonus	— 0·56	All paid.
O.	1/2·42 and dividend	— 0·58	All paid.
P.	1/2·39 and dividend	— 0·61	All paid.
Q.	1/2·25	— 0·75	All paid.

The above rates of pay may be influenced by several factors which must be taken into consideration by the dairy farmer. The following factors are illustrative of the point:—

(*a*) Payment of a dividend, bonus, or deferred pay is equivalent to an increase in the rate of pay.

(*b*) Payment for the carriage of cream by rail or road likewise is equivalent to an increase in rate of pay.

(*c*) Upon the situation of a factory depends the marketing costs to a great extent.

(*d*) The amount of butter manufactured affects the rate of pay. Large supplies reduce the rate of overhead expenses.

(*e*) Erection of new buildings and plant temporarily absorbs money, which would otherwise be available for cream pay, although the increased efficiency resulting from modern buildings and plant soon repays the dairy farmer for his investment.

(*f*) The quality of the cream supply plays an important part in the price question, for on it depends the quality of the butter and the amount received for the sale of such butter.

Consideration of the above factors will, to a great extent, explain the differences that exist in factory payments.

General Notes.

Staff Changes and Appointments.

Mr. S. M. Seamer, Inspector of Stock and Slaughter-houses, has been transferred from Cloncurry to Mount Isa as from the 1st November, 1930.

Mr. S. M. Seamer, Inspector of Stock, has been appointed also an Inspector of Slaughter-houses as from 1st November, 1930.

Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Brisbane, has been transferred to Townsville as from the 13th October, 1930.

Mr. D. H. Robertson, of Albinia Downs, Springsure, has been appointed a member of the Leichhardt South Dingo Board.

The appointment of Mr. F. H. S. Roberts as Entomologist, Department of Agriculture and Stock, Brisbane, has been confirmed as from the 23rd January, 1930.

Police Constable P. J. Hotham has been appointed an Inspector under "*The Slaughtering Act of* 1898," at Imbil.

Animal and Bird Sanctuaries.

The new University site, situated on the Brisbane River at St. Lucia, and another property belonging to the University and situated on the main Moggill road, near the confluence of Moggill Creek and the Brisbane River, and containing respectively 223 acres and 693 acres, have been declared sanctuaries under "*The Animals and Birds Acts,* 1921 *to* 1924," in which it shall be unlawful for any person to take or kill any animal or bird. Messrs J. Pacey and B. Baker have been appointed Honorary Rangers for the lastmentioned sanctuary, as from the 8th November, 1930.

Proposed Egg Board.

The first egg pool was created in 1923 and it applied to all owners of 100 fowls or more in that part of Queensland east of a straight line drawn from Bundaberg to Goondiwindi. The pool was extended from time to time, and after a referendum of all those concerned it was in 1926 made to apply to owners of fifty fowls or over, instead of 100. This pool still exists, and expires in 1933, but, with the consent of a majority of producers it may, of course, be further extended after that date. The promoters of the pool, however, asked that it should be made applicable to all producers of eggs for sale irrespective of the number of fowls they own. This suggestion was not approved, and subsequently a deputation of poultrymen waited upon the Minister and urged that all poultrymen selling eggs from twenty fowls or over be brought under the pool.

A petition signed by about 190 growers of eggs was handed in asking that the pool be made applicable to all poultrymen selling eggs from twenty fowls or over. A notice of intention to create such a pool was issued on the 21st August, 1930, but later on the proposal was dropped. The question has been again raised, and as a result the Governor in Council has now approved of the issue of a notice of intention to make an Order in Council creating an egg pool to apply to poultrymen selling eggs from 20 fowls or over, this pool to be constituted on the following basis:—

1. All eggs produced for sale by poultrymen with 20 fowls or over within that area to the east of a straight line from Bundaberg to Goondiwindi to come under the pool.
2. Eggs required for the grower's family for food or for his own use for breeding to be exempt from the pool.
3. The board to be five poultrymen's representatives and the Director of Marketing or a deputy appointed by the Minister.
4. All eggs for sale produced by owners of 20 fowls and over to become the property of the board.
5. The pool will be for a period of ten years.
6. At the referendum to decide whether the pool shall be created a vote to be given to all who will come under it.
7. All poultry raisers selling eggs are to be registered.
8. Any merchant who deals in eggs except with the approval of the pool shall commit an offence.
9. The board may levy ½d. per dozen on eggs delivered to it or to its agents.

10. The board is also empowered to make a levy of ½d. per dozen under each of the following headings:—
    (*a*) For establishing an insurance fund against fire or other casualty;
    (*b*) For establishing a reserve;
    (*c*) For establishing a fund for any special object which may be in the common interests of poultry raisers.
11. All assets and liabilities of the existing pool to be transferred to the new pool.
12. A petition for a referendum may be handed in.
13. If a referendum is conducted a 60 per cent. majority will create the pool, and every poultryman who will come under the pool will be entitled to vote; in other words, the egg producers directly concerned will decide the issue.
14. If no petition is received the pool will be automatically established.
15. If the pool is rejected at the referendum, the old or existing pool will continue to function until the 31st December, 1933, just as if this new pool had never been mooted.

Any petition for a poll to decide whether the Order in Council creating an egg pool as above shall be made must be signed by at least fifty growers of eggs, and must reach the Minister on or before 5 p.m. on the 9th December, 1930. The term egg producers will cover—

(*a*) Any person owning 20 or more domesticated fowls, i.e., domesticated hens with or without the males and/or the young thereof;

(*b*) Any person keeping 20 or more domesticated fowls;

(*c*) Each member of any partnership which keeps 20 or more domesticated fowls, provided that each partnership shall have only one vote between them;

(*d*) Each member of any family which collectively owns or keeps 20 or more domesticated fowls, provided that each family shall have only one vote between them.

In order to ensure their names being on the roll of persons eligible to vote on any matters in connection with the proposed egg board, persons who are producers are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 9th December 1930, for election as producers' representatives on the proposed egg board.

Five representatives are to be elected by producers who, at any time in the last twelve months, produced eggs for sale in the following districts in the State of Queensland. One representative is to be elected for each:—

No. 1 District.—Such portions of the Petty Sessions Districts of Bundaberg, Gin Gin, Mount Perry, Eidsvold, Childers, Maryborough, Biggenden, Gayndah, Gympie, Kilkivan, Wienholt, Nanango, Maroochy, Caboolture, Woodford, and Kilcoy as are east of a line drawn from Bundaberg to Goondiwindi.

No. 2 District.—The Petty Sessions Districts of Redcliffe and that portion of Brisbane north of the Brisbane River.

No. 3 District.—The Petty Sessions Districts of Wynnum, Cleveland, and that portion of Brisbane south of the Brisbane River.

No. 4 District.—The Petty Sessions Districts of Logan, Southport, Beaudesert, Goodna, Ipswich, Lowood, Esk, Marburg, Harrisville, Dugandan, Rosewood, Laidley, Gatton, Helidon, and Toogoolawah.

No. 5 District.—Such portions of the Petty Sessions Districts of Toowoomba, Clifton, Pittsworth, Allora, Warwick, Killarney, Inglewood, Texas, Goondiwindi, Stanthorpe, Highfields, Crow's Nest, Oakey, Goombungee, Cooyar, Jondaryan, Cecil Plains, and Dalby as are east of a straight line from Bundaberg to Goondiwindi.

Each nomination is to be signed by at least ten (10) producers in the district concerned. The elected representatives will hold office for a period of one year as from the date of appointment.

Arrowroot Board Levy.

In 1924, an Order in Council was passed empowering the Arrowroot Board to make a levy on arrowroot-growers at the rate of 4d. per ton for the administrative expenses of the Board. This levy has been found to be insufficient for the purpose, and accordingly an Order in Council has now been passed increasing the levy to 6d. per ton.

Banana Weevil Borer—Investigation Committee.

By a regulation issued under the Fruit Marketing Organisation Acts on the 21st April, 1927, provision was made for the formation of a Committee of Investigation to inquire into the claims in connection with the reward of £2,500 for an effective scheme of treatment for the control of the banana weevil borer. The Committee of Direction of Fruit Marketing made application for an alteration of the personnel of the Committee, and the present Committee will therefore comprise Professor E. J. Goddard, Messrs. R. Veitch, J. A. Weddell, K. R. Heck, A. E. Maher, and W. Ranger.

Notice to Buyers of Fertilisers.

Farmers and other buyers would be well advised not to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of nitrogen, phosphoric acid, and potash. and the forms in which they respectively occur. The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material. In the absence of such label and invoice certificate, it is obvious that the buyer should at once communicate with the Department of Agriculture, William street, Brisbane. Buyers are urged to examine all goods on the day of delivery, and when in doubt regarding any fertilisers, seeds, stock foods, or pest destroyers, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be immediately investigated.

Christmas Gifts.

The time-worn question of what to give for a Christmas present is solved by the display of seasonal goods at Pike Brothers.

Presents from Pike Brothers are always acceptable, whether the cost be considerable or modest. It will be wise to shop early and have the advantage of being able to make a selection from a wide range, especially from among several exclusive lines that are of very limited stock. There are several unique, new styles of watches, rare *and exquisite perfumes, charming lingerie, silk ties, leather goods, pipes, and other* suitable gifts, all well worth a thought when planning Christmas surprises.

Central Cane Prices Board.

The Central Sugar Cane Prices Board has been constituted for a period of three years as from the 13th November, 1930, to consist of the following members:—

His Honour Mr. Justice William Flood Webb (Chairman),
Thomas Alfred Powell (Canegrowers' Representative),
Ernest Stanley Smith (Millowners' Representative),
John McClew MacGibbon (Qualified Sugar Chemist), and
Alexander Robert Henry (Secretary).

Highly Efficient Canecutters Earn their Money.

A vigorous defence of the Queensland canecutter was made by Mr. W. J. Riordan (A.W.U.) when giving evidence before the Commonwealth Committee of Inquiry into the sugar industry. These men, said Mr. Riordan, particularly the young Australians and North Queenslanders, were doing work which demanded highly scientific skill, and those theorists who had written books on fatigue had nothing on these virile cutters. It was very seldom that an old man was found in the cutting gangs. The fastest man was selected to make the pace in the field, and a slow man did not last very long. He was quickly dropped. A visitor to the camps could see them being rubbed with embrocation, and even when engaged in cutting they rested for brief periods if they felt that the strenuous work was likely to impair their efficiency. "So far as I am concerned," remarked Mr. Dutton, a member of the committee, "the cutters earn their money."

Barley Board—Skinless Barley Exemption.

A notice was published in the "Government Gazette" recently to the effect that skinless barley had been exempted from the operations of the Barley Board. In drawing attention to this notice it was stated that, accordingly, the Board's operations would, in future, apply only to malting barley. This statement was obviously incorrect, as the Board will, in future, apply to all barley produced in Queensland, including malting and Cape barley, but with the sole exception of skinless barley.

Introduction of Apples and Pears to Warwick-Stanthorpe District.

On the 21st August, 1930, a Proclamation was issued in which it was declared that all fruit of both apples and pears consigned to any railway station between Wallangarra and Warwick, both inclusive, must be accompanied by a certificate signed by an inspector setting forth that the fruit had been examined and found to be free from the disease "Black Spot," and that such consignments must previously be brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before a certificate would be issued. However, it was found that the Proclamation did not have the desired effect, as fruit merchants adopted the practice of consigning their fruit by rail to Mill Hill, and then to Warwick and other stations per motor truck. Therefore a new Proclamation has been issued, rescinding the former one, which declares that all apples and pears shall be permitted to be introduced into that part of the State comprising the petty sessions districts of Stanthorpe, Warwick, Killarney, Allora, and Clifton, only on condition that the fruit is accompanied by a certificate signed by an inspector stating that the fruit has been examined and found to be free from "Black Spot," and that consignments thereof from Brisbane to any place abovementioned were previously brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before the certificate was issued. This will obviate the difficulty at present experienced, as the conditions will apply to all fruit of apples and pears introduced into the Warwick-Stanthorpe district by rail or road.

Fur-Bearing Rabbits—Amendment of Regulations.

Regulations were issued under the Animals and Birds Acts of this State on the 23rd January, 1930, providing for the licensing of Angora, Chinchilla, or any approved fur-bearing rabbits. Provision was made for the taking of all possible precautions for the safe maintenance of these rabbits in enclosures built in accordance with certain plans and specifications.

The Angora is imported in greater numbers into this State, but the Chinchilla rabbits have been secured by a few rabbit fanciers. The Angora is purely a wool rabbit, and is such a delicate animal that no danger is to be apprehended even if the animal managed to escape from an enclosure, as it would quickly die or be destroyed by cats or dogs. On the other hand, Queensland is still hampered somewhat by lack of experience of the habits of the Chinchilla, and a difference of opinion still exists as to whether this type of rabbit is a burrower, although the evidence available tends to indicate that he does burrow. Consequently, it has been thought desirable to postpone the issue of further licenses for the maintenance of the Chinchilla and other fur-bearing rabbits, and it has been declared that no one shall be granted a license under the regulations, as they are now amended, to keep Chinchilla rabbits unless he holds a license to keep such rabbits in respect of the year 1930 or some part thereof.

Briefly, Angora rabbits may still be introduced. No more Chinchilla or other fur-bearing rabbits may be introduced, but those persons who have these rabbits now in Queensland may continue to keep them, but they will not be allowed to dispose of any of the progeny to anybody else. Chinchilla rabbits now on order overseas can be delivered in Queensland to registered dealers on the understanding that they only go to persons who at present keep Chinchillas.

The Romantic North.

Port Douglas beach, in North Queensland, according to the Minister for Mines (Mr. E. A. Atherton), is an enchanting place. In the Legislative Assembly recently, discussing the vote for the Intelligence and Tourist Bureau, he said that couples went motoring on that beach, where they became so enamoured of one another that they stopped the car. In the course of time the tide rose, isolating them from the mainland, and they were forced to remain there till the waters subsided. He advised every one who has not been there to visit North Queensland.

Travelling Schools.

The Queensland travelling manual training and domestic science schools are in operation for the especial benefit of primary school pupils and adults living in places remote from rural schools or technical colleges. These schools provide a short, continuous, intensive course of instruction, and the facilities for training thus provided are highly appreciated by the people of the far north and west. During the year the schools Nos. 1 and 4 travelled as far west as Cunnamulla, 604 miles from Brisbane; the schools Nos. 2 and 3 conducted courses at Ravenswood and at places north of Townsville and including the Atherton Tableland.

General Farm Layout.

In considering the lines upon which a dairy farm should be laid out, there are a few general principles that should be kept in view in all cases. These may be stated as follows:—

1. Easy access to all parts of the farm.
2. Efficient and economical handling of stock and performance of all farm operations.
3. Good drainage.
4. Aspect—protection from weather and openness to sunlight.
5. Economy of working.
6. Safeguarding the contents of separator and cream store-room from contamination from dust and bad smells.

What is its Capacity? How to Measure a Sheep-dipping Bath.

For the safe and effective dipping of sheep, the dipping powder or liquid must be used at exactly the strength prescribed, and to this end it is necessary that the liquid capacity of the bath be accurately gauged. The following method of measuring is recommended in a bulletin of the Stock Branch of the New South Wales Department of Agriculture:—

1. Take the length of the top, add the length of the bottom, and divide by 2. This gives the average length.
2. Take the width of the top, add the width of the bottom, and divide by 2. This gives the average width.
3. Multiply the average length by the average width by the depth to obtain the cubical contents.
4. As 1 cubic foot equals $6\frac{1}{4}$ gallons, the capacity of the dip in gallons is obtainable by multiplying the cubical contents by $6\frac{1}{4}$.

As an example of the method of calculation, take a dip 42 feet long on the top, 17 feet long on the bottom, 6 feet deep, 2 feet wide across the top, and 10 inches wide on the bottom. The figures would be as follows:—

$$\frac{42 + 17}{2} = \frac{59}{2} \text{ feet.}$$

$$\frac{2 \text{ ft.} + 10 \text{ in.}}{2} = \frac{2 \text{ ft. } 10 \text{ in.}}{2} = 1 \text{ ft. } 5 \text{ in.} = \frac{17}{12} \text{ feet.}$$

$$\frac{59}{2} \times \frac{17}{12} \times \frac{6}{1} = \frac{1003}{4} \text{ cubic feet.}$$

$$\frac{1003}{4} \times 6\frac{1}{4} = \frac{1003}{4} \times \frac{25}{4} = \frac{25075}{16} = 1{,}567\tfrac{3}{16} \text{ gallons.}$$

In ascertaining the amount of fluid in the bath, measure from the surface of the water. The dip will never be filled right to the top and therefore a measuring stick should be used to obtain a depth, or the measurements marked on the side of the dip.

Another way of ascertaining the capacity of the dipping bath is to measure water into it from a tank of known capacity. First run into the bath, say 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities, and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

CARE OF BABIES IN HOT WEATHER.

As the weather grows warmer babies need less clothing. In some parts of Queensland the weather is changeable at this season, and the baby's clothing should be regulated by the temperature, not by the calendar. Over-clothing causes sweating, and may lead to irritation and inflammation of the skin. Waterproof coverings over wet napkins are very likely to do this, and they should not be used. When it becomes really hot, the baby will be happier if he wears little or nothing besides a napkin and singlet with all his limbs free, but protected by mosquito-netting against flies and mosquitoes. He enjoys kicking his legs and waving his arms freely, and this is one of the advantages Queensland babies have.

In hot weather babies need rather less food but more water. Let them have water to drink between their feeds. A baby may be thirsty without being hungry, and if you try to satisfy his thirst with milk, which is a food, you may upset him. Be careful in increasing his diet at this season. If he is being fed on cow's milk this should be clean and fresh. As soon as possible after delivery put the milk in a small saucepan, which should be used for this purpose only, and bring it to the boiling point. Unless the milk has been properly pasteurised by a trustworthy process, this should always be done. Freshly boiled or pasteurised milk will keep quite fresh in an icebox for twenty-four hours, but without ice it cannot be expected to keep fresh for more than twelve hours. An icebox can be made of a kerosene tin placed in a box with 3 or 4 inches of dry sawdust all round, and covered by a lid.

Diarrhoea.

Babies who are being artificially fed very easily get diarrhoea in hot weather. It may be caused by overfeeding, by unsuitable food, or by milk which is stale or dirty. If an artificially fed baby begins to have loose motions, all his food and all his milk should be stopped. He should be given one dose of castor oil to clear out any undigested food, and after that he should have nothing but thin barley water slightly sweetened for twenty-four hours. If then he is not quite well you should get medical advice or take him to the nearest Baby Clinic.

Gastro-Enteritis or Dysentery.

This is a serious disease which may begin gradually with loose motions, but sometimes comes on suddenly with fever and much weakness and irritability. The motions may be simply loose at first, but after a time they are seen to contain slime tinged with blood, may be very frequent and attended by much straining. Next month there will be many cases of this disease in Queensland, and some of these babies will die, for this has been so every year. If all our mothers understood how the disease is caused, and why it spreads from house to house, there would be much less dysentery and very few deaths from this cause among our babies.

Dysentery is not caused by the heat. Usually the worst of the epidemic is over before the hottest weather begins, though sometimes it continues right through the summer. Dysentery is not caused by feeding babies on cow's milk, for all disease germs in the milk are killed by boiling or pasteurising. But it is much more common among bottle-fed babies, whatever food they are getting, than among babies on the breast. The disease is caused by dysentery bacilli, and these disease germs are conveyed by flies from closet-pans or other filth to the babies' food. Not only must the food be most carefully protected from flies, but so must the bottles and teats after they have been scalded. Even breast-fed babies are not safe if they have dummies pinned on to their frocks to invite the disease-bearing flies to settle on them.

Protect your baby against this enfeebling, painful, dangerous, and often fatal disease by natural feeding, by avoiding the dangerous dummy, and by carefully protecting its artificial food from infection by flies.

Barley-water.

To make barley-water, take one tablespoonful of pearl barley, wash it carefully, add to 1 pint of water, and simmer for one hour. Then make up to 1 pint from the kettle, and strain carefully. Prepare fresh twice daily.

CONSTIPATION IN BABIES.

Breast-fed babies are never really constipated. Their motions are always soft, though they may be passed at long and irregular intervals. This sluggishness of the bowels arises from two causes—(1) Giving castor oil to the baby; (2) want of proper training.

Castor Oil Not Necessary for the Newborn Baby.

The first effect of castor oil is to empty the bowels. Its second effect is to prevent them from acting. The harmful and unnecessary practice of giving castor oil to a newborn baby starts an irregularity which is kept up and increased by repeated doses of castor oil. There results a condition artificially manufactured by the mother or nurse, which she calls "constipation."

Once or twice a day the baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking, for fifteen or twenty minutes in warm weather. This will often induce a motion. If necessary he must be held out over a pan, just touching its rim. It is a good plan to hold out a baby after each feed. He will pass water, thus keeping his napkin dry, and will often pass a motion. If the baby's training has been long neglected, these methods may not suffice. It may then be necessary to pass a soap pencil dipped in oil, or inject a few teaspoonfuls of plain boiled water into the bowel. Gently kneading the abdomen, beginning low on the right side, upwards to the ribs, across, and down on the left side, should help. Medicines should not be necessary.

Bottle-fed Babies.

Bottle-fed babies suffer from the same mismanagement and need the same treatment. With them the condition is more troublesome, for cow's milk is often constipating and causes firmer motions, often in solid masses, and sometimes in small round lumps like pebbles. The food may need adjusting, and it would be wise to consult a clinic nurse if possible. See that the baby drinks enough water. He may be taking more milk, especially if this is dried milk, than he should. The substitution of malt-sugar in the form of Mellin's Food, Maltogen, or Extract of Malt, for some or all of the sugar in his food, is often helpful, so is prune juice given as a medicine. If drugs are necessary, fluid magnesia, milk of magnesia, and liquid petroleum oil may be given in teaspoonful doses once or twice a day. No other medicines should be given except on medical advice.

A Very Important Point.

This is very important. Whatever medicines are given for constipation, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second or third day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become permanent. The medicine should be given every day at the same time, in just sufficient doses to produce its effect and no more. The dose must be determined by trial. Once a daily regular action has been established, the dose should be slowly made less, and after a time may be left off. Used rightly, the medicine will help to cure constipation; used wrongly, the same medicine will make it worse.

THREADWORMS.

Children with threadworms generally suffer from an itchiness at the seat especially at bedtime. This may make them restless and prevent them from going to sleep. The itchiness is caused by the worms coming out of the anus and crawling about. More serious symptoms from threadworms are extremely rare in Queensland. "Picking at the nose" is not a sign of worms.

The only way to be sure that a child has threadworms is to see them in the motions. This is not difficult. They are about the size of cotton thread, about half an inch long, and are probably alive and wriggle. All sorts of things in the motions, for instance the stringy parts of bananas, are sometimes mistaken by mothers for worms. If you are in doubt, put the things into a small bottle with methylated spirits and show them to your doctor. Children should not be given medicines for worms that they have not got.

Causes.

Every threadworm grows from an egg which has been swallowed. These eggs are very small and can be seen only with a microscope. The young child swallows some of these eggs accidentally, perhaps from the fingers of another child. When the worms crawl out to lay their eggs and so cause itchiness, he crushes them with his fingers, which become covered with these invisible eggs. Even though the hands are washed clean, there remain many eggs under the finger nails. All young children put their fingers into their mouths at times, and so they are continually reinfecting themselves, and increasing the number of their worms. Older children who suffer from worms will be found nearly always to have the habit of biting their nails.

Treatment.

If the worms are numerous, medical treatment will give relief. Strong medicines are necessary, and as these may be dangerous, they should be given only under medical direction. Injections of strong salt and water (as much salt as the water will dissolve) given after the bowel has been emptied will often bring away many worms, and these injections are harmless. Though many worms may be brought away by medical treatment, there are nearly always a few left behind. From these the child will probably reinfect himself, and in a few months may have as many as before.

The real cure of threadworms depends on the mother. Make the child sleep in good thick "combinations," so that his fingers cannot get at the worms to crush them. Smear some vaseline around the anus before he goes to bed to prevent the worms crawling and causing itching, or ask your doctor for some ointment which will kill the worms when they come out. If reinfection is prevented, the few worms left will die out of themselves.

VEGETABLES.

Vegetables will require constant attention next month, particularly in the Granite Belt area. Tomatoes and potatoes should be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber, and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying: also garlic, onions, and eschalots as the tops die down.

CONTROL OF WEEDS—SOME USEFUL MEASURES.

Once some species of weeds become firmly established, eradication is practically impossible; effective control of these is only possible before they have become established. Where weeds have taken possession and landowners realise that cutting is impossible, they look with hope to the use of chemicals as a means of destruction; but the question of cost must be considered, and although chemicals have been found to be effective in destroying weeds, on the whole the cost in such cases is prohibitive.

The old method of destroying plants by hand-hoeing or cultivation still remains as practically the only effective one that can be adopted. Provided the weeds are attacked in time and every care is exercised in cutting out new plants as they appear, weeds can be kept in control by this means at a comparatively low cost. Nevertheless, from various causes, weeds may eventually become so firmly established that other methods must be adopted, and the following suggestions are made so that farmers and graziers may adapt them to their needs in accordance with the severity of the infestation and the means at their disposal.

Destruction by Cultivation.—Certain weeds that are crop pests have roots or underground stems of such a nature that the plant reproduces freely from them, and, as a consequence, these weeds (amongst them are Johnson grass, sorrel, bindweed, &c.) are difficult to control. The most effective means of controlling weeds of this type is to plough the land deeply about September, and to cultivate it in such a way that the soil moisture is dried out. This can usually be done by cultivating the land very deeply with springtooth or rigid tine cultivators.

The object should be to loosen the land as much as possible, and at the same time to bring the roots to the surface. Provided the weather remains dry, this method is fairly effective, and if the weed is not killed entirely it is thinned out to a considerably extent. Obviously, however, the method is only successful when the weather is fairly dry, and it does not give good results in districts with a heavy rainfall.

Smothering Crops.—In conjunction with the cultivation method, smothering crops can be used with excellent results. After cultivating the land thoroughly in the way suggested, a rapid-growing crop such as wheat or oats should be sown. The cultivation of the land puts it in good condition for the crop, and the rapid growth under fairly favourable conditions prevents weed growth and establishes control.

Enforced Germination.—Another method of bringing weeds under control by cultivation is to work the land in such a way that the most favourable conditions are created for the germination of seed, and then to destroy the seedlings. Every farmer knows that when crop seed is being sown the soil must be put into a favourable condition for germination, and if the object is to destroy weeds, similar conditions must prevail.

The time and method of cultivating the soil will depend on the habits of the weed. If the weed is one which grows in the spring the soil workings must be made with the object of having the soil in proper condition at that period, while on the other hand if they are winter-growing seeds the soil must be prepared for favourable germination during the autumn.

Generally the practice should be to plough the land at least a month or two before the period when germination is expected, to allow weathering, and then to work with cultivator and harrows to reduce the soil to a fine tilth. In some cases, especially if the soil is in a loose condition, it may be advisable to use a roller in order to make it firm, as germination always occurs more satisfactorily when the seed is in a firm soil with from 1 inch to 2 inches of loose, fine soil on the surface. The young seedlings are then destroyed by the subsequent cultivations given to preserve the mulch and to prepare the seed-bed for the crop.

For weeds such as saffron thistle, star thistle, and others of a similar character which infest the wheat-growing areas, this is the most effective method, but to control these and other weeds which affect the wheat crop it is necessary to adopt a system of long fallow and to have the land under cultivated fallow for about twelve months.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops

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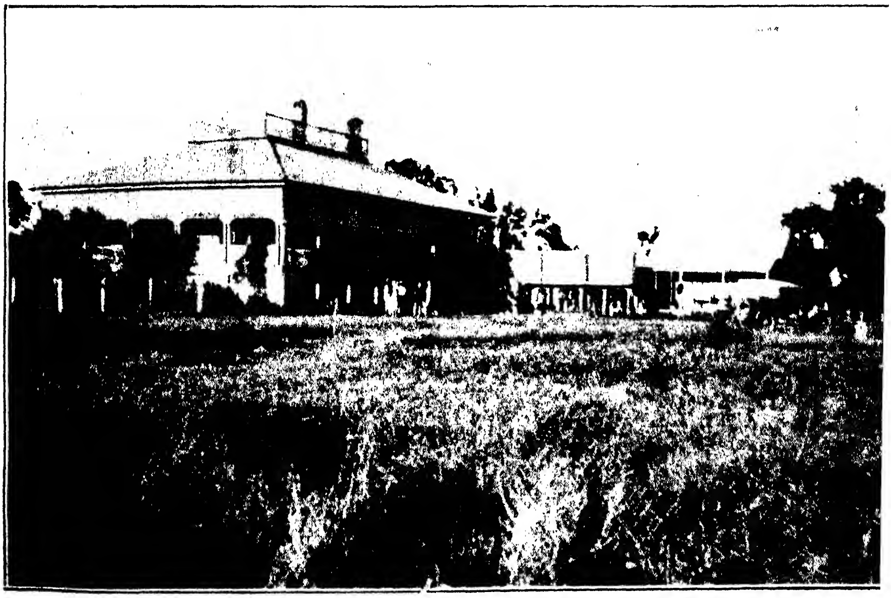

Plate 196.—Station Homestead, Eurella, *via* Roma.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1930.		January, 1931.		MOONRISE. Dec. 1930.	MOONRISE. Jan. 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4.52	6.30	5.3	6.47	1.55	3.38
2	4.52	6.30	5 3	6.47	2.53	4.41
3	4.52	6.31	5.4	6.47	3.51	5.46
4	4.53	6.32	5.4	6.48	4.52	6.49
5	4 53	6.33	5.5	6.48	5.57	7.50
6	4.53	6.34	5.6	6.48	7.0	8.42
7	4.53	6.34	5.6	6.49	8.5	9.24
8	4.53	6.35	5.7	6.49	9·6	10.12
9	4.53	6.35	5.8	6.49	10.1	10.37
10	4.54	6.36	5.9	6.49	10.47	11.9
11	4.54	6.37	5.9	6.49	11.26	11.42
12	4.54	6.38	5.10	6.49	...	...
					a.m.	a.m.
13	4.54	6 38	5.11	6 49	12.1	12.19
14	4.54	6.39	5.12	6.48	12.35	12.53
15	4.54	6.39	5.13	6.48	1.8	1.37
16	4.55	6.40	5.14	6.48	1.40	2.25
17	4.55	6.40	5.15	6 48	2.16	3.19
18	4.56	6.41	5.16	6 48	2.55	4.15
19	4.56	6.41	5.17	6 47	3.40	5.11
20	4.57	6.42	5 17	6.47	4.32	6.7
21	4.57	6.43	5.18	6.47	5.27	7.5
22	4.58	6.43	5.19	6.47	6.23	7.58
23	4 58	6.44	5.20	6.47	7.20	8.50
24	4.59	6.44	5.21	6.47	8.15	9.42
25	4.59	6.45	5.21	6.46	9.12	10.31
26	5 0	6.45	5 22	6.46	10.4	11.26
						p.m.
27	5 0	6.46	5.22	6.46	10.57	12.21
28	5.1	6.46	5.23	6 46	11.49	1.20
29	5.1	6.46	5.24	6.45	12.41	2.22
30	5.2	6.47	5.24	6.45	1.36	3.24
31	5.3	6.47	5.25	6.45	2.34	4.28

Phases of the Moon, Occultations, &c.

6 Dec.	○ Full Moon	10 40 a.m.
13 ,,	☽ Last Quarter	6 7 a.m.
20 ,,	● New Moon	11 24 a.m.
28 ,,	☾ First Quarter	1 59 p.m.

Perigee, 10th December, at 11.42 a.m.
Apogee, 26th December, at 5.48 a.m.

Mars, having apparently travelled through the constellation Cancer and reached the border of Leo on 28th November, will proceed barely 3 degrees further amongst the stars of the latter constellation until 19th December. It will then seem to come to a standstill and move backward about 5½ degrees into Cancer, until 4th May next year.

Mercury will reach its greatest elevation, 20 degrees above the western horizon, at sunset on the 20th.

Venus will be shining with unusual lustre at Christmas time, reaching its greatest phase on the 28th. It will be apparently amongst the stars of the head of Scorpio.

Mercury will set at 7.34 p.m. on the 1st and at 8.8 p.m. on the 15th.

Venus will rise at 4 a.m. on the 1st and at 3.3 a.m. on the 15th.

Mars will rise at 11.8 p.m. on the 1st and at 10.19 p.m. on the 15th.

Jupiter will rise at 9.29 p.m. on the 1st and at 8.24 p.m. an the 15th.

Saturn will set at 8.49 p.m. on the 1st and at 8.0 p.m. on the 15th.

The Southern Cross, having reached position V. about 6 p.m. on the 1st, will be coming into view in the south-east about 11 p.m. and will reach position IX. about 2 a.m.

4 Jan.	○ Full Moon	11 15 p.m.
11 ,,	☽ Last Quarter	3 9 p.m.
19 ,,	● New Moon	4 36 a.m.
27 ,,	☾ First Quarter	10 5 a.m.

Perigee, 7th January, at 12.48 a.m.
Apogee, 22nd January, at 11.18 p.m.

The Earth will be at its least distance from the Sun, 91,330,000 miles, on the 3rd.

The Moon will be passing from west to east of Jupiter, early in the morning of the 5th when both are in the north-west and Jupiter 5 degrees to the southward of the Moon.

The Sun will pass from west to east of Saturn on the 5th, about half a degree on its southern side. Saturn will then be on the far side of its orbit, 978,000,000 miles from the Earth, whereas the Sun will be only 91,500,000 miles away.

Mercury will pass from west to east of the Sun on the 6th on the side of its orbit nearest to the Earth; but being 2 degrees to the northward will avoid a transit of the Sun's face, On the 28th it will be at its greatest western elongation, 25 degrees, and rise one hour 52 minutes before the Sun.

On the opposite side of the sky Jupiter, on the 6th, will reach a position in its orbit which brings it nearly to its least distance from the Earth.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.